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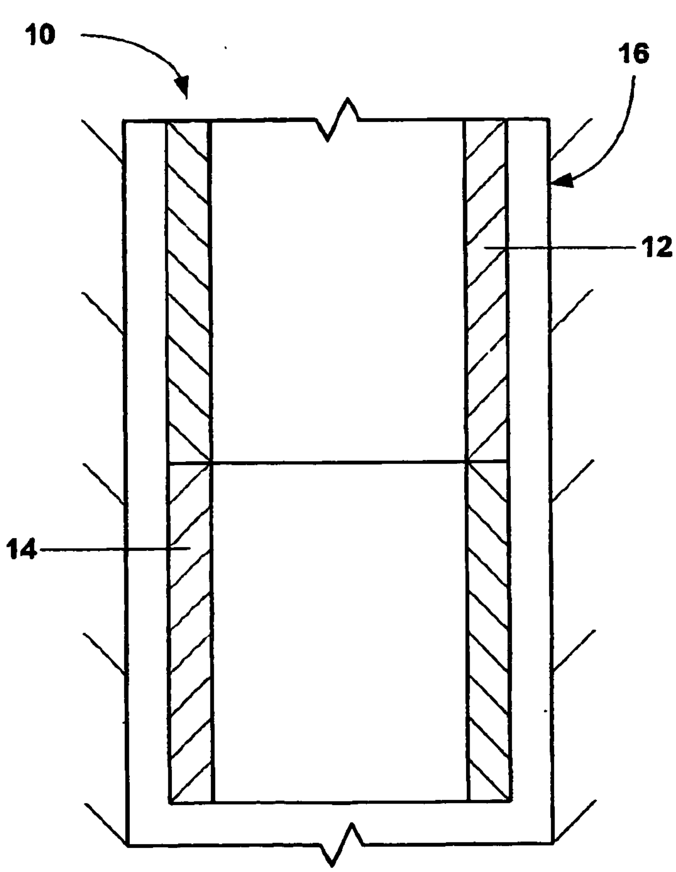
(54) Title: EXPANDABLE TUBULAR



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(57) Abstract: An expandable tubular member.

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EXPANDABLE TUBULAR

Cross Reference To Related Applications

[0001] The present application claims the benefit of the filing date of U.S. provisional patent application serial no. 60/585,370, attorney docket no. 25791.318, filed on July 2, 2004, the disclosure of which is incorporated herein by reference.

[0002] This application is related to the following co-pending applications: (1) U.S. Patent Number 6,497,289, which was filed as U.S. Patent Application serial no. 09/454,139, attorney docket no. 25791.03.02, filed on 12/3/1999, which claims priority from provisional application 60/111,293, filed on 12/7/98, (2) U.S. patent application serial no. 09/510,913, attorney docket no. 25791.7.02, filed on 2/23/2000, which claims priority from provisional application 60/121,702, filed on 2/25/99, (3) U.S. patent application serial no. 09/502,350, attorney docket no. 25791.8.02, filed on 2/10/2000, which claims priority from provisional application 60/119,611, filed on 2/11/99, (4) U.S. patent no. 6,328,113, which was filed as U.S. Patent Application serial number 09/440,338, attorney docket number 25791.9.02, filed on 11/15/99, which claims priority from provisional application 60/108,558, filed on 11/16/98, (5) U.S. patent application serial no. 10/169,434, attorney docket no. 25791.10.04, filed on 7/1/02, which claims priority from provisional application 60/183,546, filed on 2/18/00, (6) U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (7) U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (8) U.S. patent number 6,575,240, which was filed as patent application serial no. 09/511,941, attorney docket no. 25791.16.02, filed on 2/24/2000, which claims priority from provisional application 60/121,907, filed on 2/26/99, (9) U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (10) U.S. patent application serial no. 09/981,916, attorney docket no. 25791.18, filed on 10/18/01 as a continuation-in-part application of U.S. patent no. 6,328,113, which was filed as U.S. Patent Application serial number 09/440,338, attorney docket number 25791.9.02, filed on 11/15/99, which claims priority from provisional application 60/108,558, filed on 11/16/98, (11) U.S. patent number 6,604,763, which was filed as application serial no. 09/559,122, attorney docket no. 25791.23.02, filed on 4/26/2000, which claims priority from provisional application 60/131,106, filed on 4/26/99, (12) U.S. patent application serial no. 10/030,593, attorney docket no. 25791.25.08, filed on 1/8/02, which claims priority from provisional application 60/146,203, filed on 7/29/99, (13) U.S. provisional patent application serial no. 60/143,039, attorney docket no. 25791.26, filed on 7/9/99, (14) U.S. patent application serial no. 10/111,982, attorney docket no. 25791.27.08, filed on 4/30/02, which claims priority from provisional patent application serial no. 60/162,671, attorney docket no. 25791.27, filed on 11/1/1999, (15) U.S. provisional patent application serial no. 60/154,047, attorney docket no. 25791.29, filed on 9/16/1999, (16) U.S. provisional patent application serial no. 60/438,828, attorney docket no. 25791.31, filed on 1/9/03, (17) U.S. patent number 6,564,875, which was filed as application serial no. 09/679,907, attorney docket no. 25791.34.02, on 10/5/00, which claims priority from provisional patent application

serial no. 60/159,082, attorney docket no. 25791.34, filed on 10/12/1999, (18) U.S. patent application serial no. 10/089,419, filed on 3/27/02, attorney docket no. 25791.36.03, which claims priority from provisional patent application serial no. 60/159,039, attorney docket no. 25791.36, filed on 10/12/1999, (19) U.S. patent application serial no. 09/679,906, filed on 10/5/00, attorney docket no. 25791.37.02, which claims priority from provisional patent application serial no. 60/159,033, attorney docket no. 25791.37, filed on 10/12/1999, (20) U.S. patent application serial no. 10/303,992, filed on 11/22/02, attorney docket no. 25791.38.07, which claims priority from provisional patent application serial no. 60/212,359, attorney docket no. 25791.38, filed on 6/19/2000, (21) U.S. provisional patent application serial no. 60/165,228, attorney docket no. 25791.39, filed on 11/12/1999, (22) U.S. provisional patent application serial no. 60/455,051, attorney docket no. 25791.40, filed on 3/14/03, (23) PCT application US02/2477, filed on 6/26/02, attorney docket no. 25791.44.02, which claims priority from U.S. provisional patent application serial no. 60/303,711, attorney docket no. 25791.44, filed on 7/6/01, (24) U.S. patent application serial no. 10/311,412, filed on 12/12/02, attorney docket no. 25791.45.07, which claims priority from provisional patent application serial no. 60/221,443, attorney docket no. 25791.45, filed on 7/28/2000, (25) U.S. patent application serial no. 10/, filed on 12/18/02, attorney docket no. 25791.46.07, which claims priority from provisional patent application serial no. 60/221,645, attorney docket no. 25791.46, filed on 7/28/2000, (26) U.S. patent application serial no. 10/322,947, filed on 1/22/03, attorney docket no. 25791.47.03, which claims priority from provisional patent application serial no. 60/233,638, attorney docket no. 25791.47, filed on 9/18/2000, (27) U.S. patent application serial no. 10/406,648, filed on 3/31/03, attorney docket no. 25791.48.06, which claims priority from provisional patent application serial no. 60/237,334, attorney docket no. 25791.48, filed on 10/2/2000, (28) PCT application US02/04353, filed on 2/14/02, attorney docket no. 25791.50.02, which claims priority from U.S. provisional patent application serial no. 60/270,007, attorney docket no. 25791.50, filed on 2/20/2001, (29) U.S. patent application serial no. 10/465,835, filed on 6/13/03, attorney docket no. 25791.51.06, which claims priority from provisional patent application serial no. 60/262,434, attorney docket no. 25791.51, filed on 1/17/2001, (30) U.S. patent application serial no. 10/465,831, filed on 6/13/03, attorney docket no. 25791.52.06, which claims priority from U.S. provisional patent application serial no. 60/259,486, attorney docket no. 25791.52, filed on 1/3/2001, (31) U.S. provisional patent application serial no. 60/452,303, filed on 3/5/03, attorney docket no. 25791.53, (32) U.S. patent number 6,470,966, which was filed as patent application serial number 09/850,093, filed on 5/7/01, attorney docket no. 25791.55, as a divisional application of U.S. Patent Number 6,497,289, which was filed as U.S. Patent Application serial no. 09/454,139, attorney docket no. 25791.03.02, filed on 12/3/1999, which claims priority from provisional application 60/111,293, filed on 12/7/98, (33) U.S. patent number 6,561,227, which was filed as patent application serial number 09/852,026 , filed on 5/9/01, attorney docket no. 25791.56, as a divisional application of U.S. Patent Number 6,497,289, which was filed as U.S. Patent Application serial no. 09/454,139, attorney docket no. 25791.03.02, filed on 12/3/1999, which claims priority from provisional application 60/111,293, filed on 12/7/98, (34) U.S. patent application serial number 09/852,027, filed on 5/9/01, attorney docket no. 25791.57, as a divisional application of U.S. Patent Number 6,497,289, which was filed as U.S. Patent Application serial no. 09/454,139, attorney

docket no. 25791.03.02, filed on 12/3/1999, which claims priority from provisional application 60/111,293, filed on 12/7/98, (35) PCT Application US02/25608, attorney docket no. 25791.58.02, filed on 8/13/02, which claims priority from provisional application 60/318,021, filed on 9/7/01, attorney docket no. 25791.58, (36) PCT Application US02/24399, attorney docket no. 25791.59.02, filed on 8/1/02, which claims priority from U.S. provisional patent application serial no. 60/313,453, attorney docket no. 25791.59, filed on 8/20/2001, (37) PCT Application US02/29856, attorney docket no. 25791.60.02, filed on 9/19/02, which claims priority from U.S. provisional patent application serial no. 60/326,886, attorney docket no. 25791.60, filed on 10/3/2001, (38) PCT Application US02/20256, attorney docket no. 25791.61.02, filed on 6/26/02, which claims priority from U.S. provisional patent application serial no. 60/303,740, attorney docket no. 25791.61, filed on 7/6/2001, (39) U.S. patent application serial no. 09/962,469, filed on 9/25/01, attorney docket no. 25791.62, which is a divisional of U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (40) U.S. patent application serial no. 09/962,470, filed on 9/25/01, attorney docket no. 25791.63, which is a divisional of U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (41) U.S. patent application serial no. 09/962,471, filed on 9/25/01, attorney docket no. 25791.64, which is a divisional of U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (42) U.S. patent application serial no. 09/962,467, filed on 9/25/01, attorney docket no. 25791.65, which is a divisional of U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (43) U.S. patent application serial no. 09/962,468, filed on 9/25/01, attorney docket no. 25791.66, which is a divisional of U.S. patent application serial no. 09/523,468, attorney docket no. 25791.11.02, filed on 3/10/2000, which claims priority from provisional application 60/124,042, filed on 3/11/99, (44) PCT application US 02/25727, filed on 8/14/02, attorney docket no. 25791.67.03, which claims priority from U.S. provisional patent application serial no. 60/317,985, attorney docket no. 25791.67, filed on 9/6/2001, and U.S. provisional patent application serial no. 60/318,386, attorney docket no. 25791.67.02, filed on 9/10/2001, (45) PCT application US 02/39425, filed on 12/10/02, attorney docket no. 25791.68.02, which claims priority from U.S. provisional patent application serial no. 60/343,674 , attorney docket no. 25791.68, filed on 12/27/2001, (46) U.S. utility patent application serial no. 09/969,922, attorney docket no. 25791.69, filed on 10/3/2001, which is a continuation-in-part application of U.S. patent no. 6,328,113, which was filed as U.S. Patent Application serial number 09/440,338, attorney docket number 25791.9.02, filed on 11/15/99, which claims priority from provisional application 60/108,558, filed on 11/16/98, (47) U.S. utility patent application serial no. 10/516,467, attorney docket no. 25791.70, filed on 12/10/01, which is a continuation application of U.S. utility patent application serial no. 09/969,922, attorney docket no. 25791.69, filed on 10/3/2001, which is a continuation-in-part application of U.S. patent no. 6,328,113, which was filed as U.S. Patent Application serial number 09/440,338, attorney docket number 25791.9.02, filed on 11/15/99, which claims priority from provisional application 60/108,558, filed on 11/16/98, (48) PCT application US 03/00609, filed on

1/9/03, attorney docket no. 25791.71.02, which claims priority from U.S. provisional patent application serial no. 60/357,372 , attorney docket no. 25791.71, filed on 2/15/02, (49) U.S. patent application serial no. 10/074,703, attorney docket no. 25791.74, filed on 2/12/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (50) U.S. patent application serial no. 10/074,244, attorney docket no. 25791.75, filed on 2/12/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (51) U.S. patent application serial no. 10/076,660, attorney docket no. 25791.76, filed on 2/15/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (52) U.S. patent application serial no. 10/076,661, attorney docket no. 25791.77, filed on 2/15/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (53) U.S. patent application serial no. 10/076,659, attorney docket no. 25791.78, filed on 2/15/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (54) U.S. patent application serial no. 10/078,928, attorney docket no. 25791.79, filed on 2/20/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (55) U.S. patent application serial no. 10/078,922, attorney docket no. 25791.80, filed on 2/20/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (56) U.S. patent application serial no. 10/078,921, attorney docket no. 25791.81, filed on 2/20/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (57) U.S. patent application serial no. 10/261,928, attorney docket no. 25791.82, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (58) U.S. patent application serial no. 10/079,276 , attorney docket no. 25791.83, filed on 2/20/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (59) U.S. patent application serial no. 10/262,009, attorney docket no. 25791.84, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (60) U.S.

patent application serial no. 10/092,481, attorney docket no. 25791.85, filed on 3/7/02, which is a divisional of U.S. patent number 6,568,471, which was filed as patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, which claims priority from provisional application 60/121,841, filed on 2/26/99, (61) U.S. patent application serial no. 10/261,926, attorney docket no. 25791.86, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (62) PCT application US 02/36157, filed on 11/12/02, attorney docket no. 25791.87.02, which claims priority from U.S. provisional patent application serial no. 60/338,996, attorney docket no. 25791.87, filed on 11/12/01, (63) PCT application US 02/36267, filed on 11/12/02, attorney docket no. 25791.88.02, which claims priority from U.S. provisional patent application serial no. 60/339,013, attorney docket no. 25791.88, filed on 11/12/01, (64) PCT application US 03/11765, filed on 4/16/03, attorney docket no. 25791.89.02, which claims priority from U.S. provisional patent application serial no. 60/383,917, attorney docket no. 25791.89, filed on 5/29/02, (65) PCT application US 03/15020, filed on 5/12/03, attorney docket no. 25791.90.02, which claims priority from U.S. provisional patent application serial no. 60/391,703, attorney docket no. 25791.90, filed on 6/26/02, (66) PCT application US 02/39418, filed on 12/10/02, attorney docket no. 25791.92.02, which claims priority from U.S. provisional patent application serial no. 60/346,309, attorney docket no. 25791.92, filed on 1/7/02, (67) PCT application US 03/06544, filed on 3/4/03, attorney docket no. 25791.93.02, which claims priority from U.S. provisional patent application serial no. 60/372,048, attorney docket no. 25791.93, filed on 4/12/02, (68) U.S. patent application serial no. 10/331,718, attorney docket no. 25791.94, filed on 12/30/02, which is a divisional U.S. patent application serial no. 09/679,906, filed on 10/5/00, attorney docket no. 25791.37.02, which claims priority from provisional patent application serial no. 60/159,033, attorney docket no. 25791.37, filed on 10/12/1999, (69) PCT application US 03/04837, filed on 2/29/03, attorney docket no. 25791.95.02, which claims priority from U.S. provisional patent application serial no. 60/363,829, attorney docket no. 25791.95, filed on 3/13/02, (70) U.S. patent application serial no. 10/261,927, attorney docket no. 25791.97, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (71) U.S. patent application serial no. 10/262,008, attorney docket no. 25791.98, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (72) U.S. patent application serial no. 10/261,925, attorney docket no. 25791.99, filed on 10/1/02, which is a divisional of U.S. patent number 6,557,640, which was filed as patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, which claims priority from provisional application 60/137,998, filed on 6/7/99, (73) U.S. patent application serial no. 10/199,524, attorney docket no. 25791.100, filed on 7/19/02, which is a continuation of U.S. Patent Number 6,497,289, which was filed as U.S. Patent Application serial no. 09/454,139, attorney docket no. 25791.03.02, filed on 12/3/1999, which claims priority from provisional application 60/111,293, filed on 12/7/98, (74) PCT application US 03/10144,

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Background of the Invention

[0003] This invention relates generally to oil and gas exploration, and in particular to forming and repairing wellbore casings to facilitate oil and gas exploration.

Summary Of The Invention

[0004] According to one aspect of the present invention, a method of forming a tubular liner within a preexisting structure is provided that includes positioning a tubular assembly within the preexisting structure; and radially expanding and plastically deforming the tubular assembly within the preexisting structure, wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

[0005] According to another aspect of the present invention, an expandable tubular member is provided that includes a steel alloy including: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

[0006] According to another aspect of the present invention, an expandable tubular member is provided that includes a steel alloy including: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

[0007] According to another aspect of the present invention, an expandable tubular member is provided that includes a steel alloy including: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

[0008] According to another aspect of the present invention, an expandable tubular member is provided that includes a steel alloy including: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

[0009] According to another aspect of the present invention, an expandable tubular member is provided, wherein the yield point of the expandable tubular member is at most about 46.9 ksi prior to a radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 65.9 ksi after the radial expansion and plastic deformation.

[0010] According to another aspect of the present invention, an expandable tubular member is provided, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 40 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

[0011] According to another aspect of the present invention, an expandable tubular member is provided, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.48.

[0012] According to another aspect of the present invention, an expandable tubular member is provided, wherein the yield point of the expandable tubular member is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 74.4 ksi after the radial expansion and plastic deformation.

[0013] According to another aspect of the present invention, an expandable tubular member is provided, wherein the yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 28 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

[0014] According to another aspect of the present invention, an expandable tubular member is provided, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.04.

[0015] According to another aspect of the present invention, an expandable tubular member is provided, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.92.

[0016] According to another aspect of the present invention, an expandable tubular member is provided, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.34.

[0017] According to another aspect of the present invention, an expandable tubular member is provided, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

[0018] According to another aspect of the present invention, an expandable tubular member is provided, wherein the yield point of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

[0019] According to another aspect of the present invention, an expandable tubular member is provided, wherein the expandability coefficient of the expandable tubular member, prior to the radial expansion and plastic deformation, is greater than 0.12.

[0020] According to another aspect of the present invention, an expandable tubular member is provided, wherein the expandability coefficient of the expandable tubular member is greater than the expandability coefficient of another portion of the expandable tubular member.

[0021] According to another aspect of the present invention, an expandable tubular member is provided, wherein the tubular member has a higher ductility and a lower yield point prior to a radial expansion and plastic deformation than after the radial expansion and plastic deformation.

[0022] According to another aspect of the present invention, a method of radially expanding and plastically deforming a tubular assembly including a first tubular member coupled to a second tubular member is provided that includes radially expanding and plastically deforming the tubular assembly within a preexisting structure; and using less power to radially expand each unit length of the first tubular member than to radially expand each unit length of the second tubular member.

[0023] According to another aspect of the present invention, a system for radially expanding and plastically deforming a tubular assembly including a first tubular member coupled to a second tubular member is provided that includes means for radially expanding the tubular assembly within a preexisting structure; and means for using less power to radially expand each unit length of the first tubular member than required to radially expand each unit length of the second tubular member.

[0024] According to another aspect of the present invention, a method of manufacturing a tubular member is provided that includes processing a tubular member until the tubular member is characterized by one or more intermediate characteristics; positioning the tubular member within a preexisting structure; and processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics.

[0025] According to another aspect of the present invention, an apparatus is provided that includes an expandable tubular assembly; and an expansion device coupled to the expandable tubular assembly; wherein a predetermined portion of the expandable tubular assembly has a lower yield point than another portion of the expandable tubular assembly.

[0026] According to another aspect of the present invention, an expandable tubular member is provided, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 5.8 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

[0027] According to another aspect of the present invention, a method of determining the expandability of a selected tubular member is provided that includes determining an anisotropy value for the selected tubular member, determining a strain hardening value for the selected tubular member; and multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member.

[0028] According to another aspect of the present invention, a method of radially expanding and plastically deforming tubular members is provided that includes selecting a tubular member; determining an anisotropy value for the selected tubular member; determining a strain hardening value for the selected tubular member; multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member; and if the anisotropy value is greater than 0.12, then radially expanding and plastically deforming the selected tubular member.

[0029] According to another aspect of the present invention, a radially expandable tubular member apparatus is provided that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; and a sleeve overlapping and coupling the first

and second tubular members at the joint; wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus.

[0030] According to another aspect of the present invention, a radially expandable tubular member apparatus is provided that includes: a first tubular member; a second tubular member engaged with the first tubular member forming a joint; a sleeve overlapping and coupling the first and second tubular members at the joint; the sleeve having opposite tapered ends and a flange engaged in a recess formed in an adjacent tubular member; and one of the tapered ends being a surface formed on the flange; wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus.

[0031] According to another aspect of the present invention, a method of joining radially expandable tubular members is provided that includes: providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve; mounting the sleeve for overlapping and coupling the first and second tubular members at the joint; wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

[0032] According to another aspect of the present invention, a method of joining radially expandable tubular members is provided that includes providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve having opposite tapered ends and a flange, one of the tapered ends being a surface formed on the flange; mounting the sleeve for overlapping and coupling the first and second tubular members at the joint, wherein the flange is engaged in a recess formed in an adjacent one of the tubular members; wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

[0033] According to another aspect of the present invention, an expandable tubular assembly is provided that includes a first tubular member; a second tubular member coupled to the first tubular member; a first threaded connection for coupling a portion of the first and second tubular members; a second threaded connection spaced apart from the first threaded connection for coupling another portion of the first and second tubular members; a tubular sleeve coupled to and receiving end portions of the first and second tubular members; and a sealing element positioned between the first and second spaced apart threaded connections for sealing an interface between the first and second tubular member; wherein the sealing element is positioned within an annulus defined between the first and second tubular members; and wherein, prior to a radial expansion and plastic deformation of the assembly, a predetermined portion of the assembly has a lower yield point than another portion of the apparatus.

[0034] According to another aspect of the present invention, a method of joining radially expandable tubular members is provided that includes: providing a first tubular member; providing a second tubular member; providing a sleeve; mounting the sleeve for overlapping and coupling the first and second tubular members; threadably coupling the first and second tubular members at a first location; threadably coupling the first and second tubular members at a second location spaced apart from the first location; sealing an interface between the first and second tubular members between the first and second locations using a compressible sealing element, wherein the first tubular member, second tubular member, sleeve, and the sealing element define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

[0035] According to another aspect of the present invention, an expandable tubular member is provided, wherein the carbon content of the tubular member is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.21.

[0036] According to another aspect of the present invention, an expandable tubular member is provided, wherein the carbon content of the tubular member is greater than 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.36.

[0037] According to another aspect of the present invention, a method of selecting tubular members for radial expansion and plastic deformation is provided that includes selecting a tubular member from a collection of tubular member; determining a carbon content of the selected tubular member; determining a carbon equivalent value for the selected tubular member; and if the carbon content of the selected tubular member is less than or equal to 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.21, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

[0038] According to another aspect of the present invention, a method of selecting tubular members for radial expansion and plastic deformation is provided that includes selecting a tubular member from a collection of tubular member; determining a carbon content of the selected tubular member; determining a carbon equivalent value for the selected tubular member; and if the carbon content of the selected tubular member is greater than 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.36, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

[0039] According to another aspect of the present invention, an expandable tubular member is provided that includes a tubular body; wherein a yield point of an inner tubular portion of the tubular body is less than a yield point of an outer tubular portion of the tubular body.

[0040] According to another aspect of the present invention, a method of manufacturing an expandable tubular member has been provided that includes: providing a tubular member; heat treating the tubular member; and quenching the tubular member; wherein following the quenching, the tubular member comprises a microstructure comprising a hard phase structure and a soft phase structure.

[0041] According to another aspect of the present invention, a method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member is provided that includes forming the expandable member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0042] According to another aspect of the present invention, an expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member is provided that includes a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0043] According to another aspect of the present invention, a structural completion positioned within a structure is provided that includes one or more radially expanded and plastically deformed expandable members positioned within the structure; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0044] According to another aspect of the present invention, a method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member is provided that includes forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0045] According to another aspect of the present invention, an expandable member for use in completing a wellbore by radially expanding and plastically deforming the expandable member at a downhole location in the wellbore is provided that includes a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0046] According to another aspect of the present invention, a structural completion is provided that includes one or more radially expanded and plastically deformed expandable members positioned within the wellbore; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0047] According to another aspect of the present invention, a method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member is provided that includes forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0048] According to another aspect of the present invention, an expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member is provided that includes a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0049] According to another aspect of the present invention, a structural completion is provided that includes one or more radially expanded and plastically deformed expandable members; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0050] According to another aspect of the present invention, a method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member is provided that includes forming the expandable member from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0051] According to another aspect of the present invention, an expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member is provided that includes a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0052] According to another aspect of the present invention, a structural completion is provided that includes one or more radially expanded and plastically deformed expandable members; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0053] According to another aspect of the present invention, a method for manufacturing an expandable tubular member used to complete a structure by radially expanding and plastically deforming the expandable member is provided that includes forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0054] According to another aspect of the present invention, an expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member is provided that includes an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0055] According to another aspect of the present invention, a structural completion is provided that includes one or more radially expanded and plastically deformed expandable members positioned within the structure; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0056] According to another aspect of the present invention, a method of constructing a structure is provided that includes radially expanding and plastically deforming an expandable member; wherein an outer portion of the wall thickness of the radially expanded and plastically deformed expandable member comprises tensile residual stresses.

[0057] According to another aspect of the present invention, a structural completion is provided that includes one or more radially expanded and plastically deformed expandable members; wherein an outer portion of the wall thickness of one or more of the radially expanded and plastically deformed expandable members comprises tensile residual stresses.

[0058] According to another aspect of the present invention, a method of constructing a structure using an expandable tubular member is provided that includes strain aging the expandable member; and then radially expanding and plastically deforming the expandable member.

[0059] According to another aspect of the present invention, a method for manufacturing a tubular member used to complete a wellbore by radially expanding the tubular member at a downhole location in the wellbore is provided that includes forming a steel alloy comprising a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy.

[0060] According to another aspect of the present invention, an expandable tubular member is provided that is fabricated from a steel alloy having a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy.

[0061] According to another aspect of the present invention, a method for manufacturing an expandable tubular member used to complete a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore is provided that includes forming the expandable tubular member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs; forming the expandable member from a steel alloy comprising a charpy V-notch impact toughness of at least about 6 joules; forming the expandable member from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and strain aging the expandable tubular member prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

[0062] According to another aspect of the present invention, an expandable tubular member for use in completing a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore is provided that includes a steel alloy having a charpy energy of at least about 90 ft-lbs; a steel alloy having a charpy V-notch impact toughness of at least about 6 joules; and a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about

0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; wherein a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and wherein the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

[0063] According to another aspect of the present invention, a wellbore completion positioned within a wellbore that traverses a subterranean formation is provided that includes one or more radially expanded and plastically deformed expandable tubular members positioned within the wellbore completion; wherein one or more of the radially expanded and plastically deformed expandable tubular members are fabricated from: a steel alloy comprising a charpy energy of at least about 90 ft-lbs; a steel alloy comprising a charpy V-notch impact toughness of at least about 6 joules; and a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; wherein at least one of the expandable members comprises a ratio of the of an outside diameter of the expandable member to a wall thickness of the expandable member ranging from about 12 to 22; wherein an outer portion of the wall thickness of at least one of the radially expanded and plastically deformed expandable comprises tensile residual stresses; and wherein at least one of the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

Brief Description of the Drawings

[0064] Fig. 1 is a fragmentary cross sectional view of an exemplary embodiment of an expandable tubular member positioned within a preexisting structure.

[0065] Fig. 2 is a fragmentary cross sectional view of the expandable tubular member of Fig. 1 after positioning an expansion device within the expandable tubular member.

[0066] Fig. 3 is a fragmentary cross sectional view of the expandable tubular member of Fig. 2 after operating the expansion device within the expandable tubular member to radially expand and plastically deform a portion of the expandable tubular member.

[0067] Fig. 4 is a fragmentary cross sectional view of the expandable tubular member of Fig. 3 after operating the expansion device within the expandable tubular member to radially expand and plastically deform another portion of the expandable tubular member.

[0068] Fig. 5 is a graphical illustration of exemplary embodiments of the stress/strain curves for several portions of the expandable tubular member of Figs. 1-4.

[0069] Fig. 6 is a graphical illustration of the an exemplary embodiment of the yield strength vs. ductility curve for at least a portion of the expandable tubular member of Figs. 1-4.

[0070] Fig. 7 is a fragmentary cross sectional illustration of an embodiment of a series of overlapping expandable tubular members.

[0071] Fig. 8 is a fragmentary cross sectional view of an exemplary embodiment of an expandable tubular member positioned within a preexisting structure.

[0072] Fig. 9 is a fragmentary cross sectional view of the expandable tubular member of Fig. 8 after positioning an expansion device within the expandable tubular member.

[0073] Fig. 10 is a fragmentary cross sectional view of the expandable tubular member of Fig. 9 after operating the expansion device within the expandable tubular member to radially expand and plastically deform a portion of the expandable tubular member.

[0074] Fig. 11 is a fragmentary cross sectional view of the expandable tubular member of Fig. 10 after operating the expansion device within the expandable tubular member to radially expand and plastically deform another portion of the expandable tubular member.

[0075] Fig. 12 is a graphical illustration of exemplary embodiments of the stress/strain curves for several portions of the expandable tubular member of Figs. 8-11.

[0076] Fig. 13 is a graphical illustration of an exemplary embodiment of the yield strength vs. ductility curve for at least a portion of the expandable tubular member of Figs. 8-11.

[0077] Fig. 14 is a fragmentary cross sectional view of an exemplary embodiment of an expandable tubular member positioned within a preexisting structure.

[0078] Fig. 15 is a fragmentary cross sectional view of the expandable tubular member of Fig. 14 after positioning an expansion device within the expandable tubular member.

[0079] Fig. 16 is a fragmentary cross sectional view of the expandable tubular member of Fig. 15 after operating the expansion device within the expandable tubular member to radially expand and plastically deform a portion of the expandable tubular member.

[0080] Fig. 17 is a fragmentary cross sectional view of the expandable tubular member of Fig. 16 after operating the expansion device within the expandable tubular member to radially expand and plastically deform another portion of the expandable tubular member.

[0081] Fig. 18 is a flow chart illustration of an exemplary embodiment of a method of processing an expandable tubular member.

[0082] Fig. 19 is a graphical illustration of the an exemplary embodiment of the yield strength vs. ductility curve for at least a portion of the expandable tubular member during the operation of the method of Fig. 18.

[0083] Fig. 20 is a graphical illustration of stress/strain curves for an exemplary embodiment of an expandable tubular member.

[0084] Fig. 21 is a graphical illustration of stress/strain curves for an exemplary embodiment of an expandable tubular member.

[0085] Fig. 22 is a fragmentary cross-sectional view illustrating an embodiment of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, an embodiment of a tubular sleeve supported by the end portion of the first tubular member, and a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member and engaged by a flange of the sleeve. The sleeve includes the flange at one end for increasing axial compression loading.

[0086] Fig. 23 is a fragmentary cross-sectional view illustrating an embodiment of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes flanges at opposite ends for increasing axial tension loading.

[0087] Fig. 24 is a fragmentary cross-sectional illustration of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes flanges at opposite ends for increasing axial compression/tension loading.

[0088] Fig. 25 is a fragmentary cross-sectional illustration of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes flanges at opposite ends having sacrificial material thereon.

[0089] Fig. 26 is a fragmentary cross-sectional illustration of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes a thin walled cylinder of sacrificial material.

[0090] Fig. 27 is a fragmentary cross-sectional illustration of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes a variable thickness along the length thereof.

[0091] Fig. 28 is a fragmentary cross-sectional illustration of the radial expansion and plastic deformation of a portion of a first tubular member having an internally threaded connection at an end portion, a second tubular member having an externally threaded portion coupled to the internally threaded portion of the first tubular member, and an embodiment of a tubular sleeve supported by the end portion of both tubular members. The sleeve includes a member coiled onto grooves formed in the sleeve for varying the sleeve thickness.

[0092] Fig. 29 is a fragmentary cross-sectional illustration of an exemplary embodiment of an expandable connection.

[0093] Figs. 30a-30c are fragmentary cross-sectional illustrations of exemplary embodiments of expandable connections.

[0094] Fig. 31 is a fragmentary cross-sectional illustration of an exemplary embodiment of an expandable connection.

[0095] Figs. 32a and 32b are fragmentary cross-sectional illustrations of the formation of an exemplary embodiment of an expandable connection.

[0096] Fig. 33 is a fragmentary cross-sectional illustration of an exemplary embodiment of an expandable connection.

[0097] Figs. 34a, 34b and 34c are fragmentary cross-sectional illustrations of an exemplary embodiment of an expandable connection.

[0098] Fig. 35a is a fragmentary cross-sectional illustration of an exemplary embodiment of an expandable tubular member.

[0099] Fig. 35b is a graphical illustration of an exemplary embodiment of the variation in the yield point for the expandable tubular member of Fig. 35a.

[0100] Fig. 36a is a flow chart illustration of an exemplary embodiment of a method for processing a tubular member.

[0101] Fig. 36b is an illustration of the microstructure of an exemplary embodiment of a tubular member prior to thermal processing.

[0102] Fig. 36c is an illustration of the microstructure of an exemplary embodiment of a tubular member after thermal processing.

[0103] Fig. 37a is a flow chart illustration of an exemplary embodiment of a method for processing a tubular member.

[0104] Fig. 37b is an illustration of the microstructure of an exemplary embodiment of a tubular member prior to thermal processing.

[0105] Fig. 37c is an illustration of the microstructure of an exemplary embodiment of a tubular member after thermal processing.

[0106] Fig. 38a is a flow chart illustration of an exemplary embodiment of a method for processing a tubular member.

[0107] Fig. 38b is an illustration of the microstructure of an exemplary embodiment of a tubular member prior to thermal processing.

[0108] Fig. 38c is an illustration of the microstructure of an exemplary embodiment of a tubular member after thermal processing.

Detailed Description of the Illustrative Embodiments

[0109] Referring initially to Fig. 1, an exemplary embodiment of an expandable tubular assembly 10 includes a first expandable tubular member 12 coupled to a second expandable tubular member 14. In several exemplary embodiments, the ends of the first and second expandable tubular members, 12 and 14, are coupled using, for example, a conventional mechanical coupling, a welded connection, a brazed connection, a threaded connection, and/or an interference fit connection. In an exemplary embodiment, the first expandable tubular member 12 has a plastic yield point YP_1, and the second expandable tubular member 14 has a plastic yield point YP_2. In an exemplary embodiment,

the expandable tubular assembly 10 is positioned within a preexisting structure such as, for example, a wellbore 16 that traverses a subterranean formation 18.

[0110] As illustrated in Fig. 2, an expansion device 20 may then be positioned within the second expandable tubular member 14. In several exemplary embodiments, the expansion device 20 may include, for example, one or more of the following conventional expansion devices: a) an expansion cone; b) a rotary expansion device; c) a hydroforming expansion device; d) an impulsive force expansion device; d) any one of the expansion devices commercially available from, or disclosed in any of the published patent applications or issued patents, of Weatherford International, Baker Hughes, Halliburton Energy Services, Shell Oil Co., Schlumberger, and/or Enventure Global Technology L.L.C. In several exemplary embodiments, the expansion device 20 is positioned within the second expandable tubular member 14 before, during, or after the placement of the expandable tubular assembly 10 within the preexisting structure 16.

[0111] As illustrated in Fig. 3, the expansion device 20 may then be operated to radially expand and plastically deform at least a portion of the second expandable tubular member 14 to form a bell-shaped section.

[0112] As illustrated in Fig. 4, the expansion device 20 may then be operated to radially expand and plastically deform the remaining portion of the second expandable tubular member 14 and at least a portion of the first expandable tubular member 12.

[0113] In an exemplary embodiment, at least a portion of at least a portion of at least one of the first and second expandable tubular members, 12 and 14, are radially expanded into intimate contact with the interior surface of the preexisting structure 16.

[0114] In an exemplary embodiment, as illustrated in Fig. 5, the plastic yield point YP_1 is greater than the plastic yield point YP_2. In this manner, in an exemplary embodiment, the amount of power and/or energy required to radially expand the second expandable tubular member 14 is less than the amount of power and/or energy required to radially expand the first expandable tubular member 12.

[0115] In an exemplary embodiment, as illustrated in Fig. 6, the first expandable tubular member 12 and/or the second expandable tubular member 14 have a ductility D_{PE} and a yield strength YS_{PE} prior to radial expansion and plastic deformation, and a ductility D_{AE} and a yield strength YS_{AE} after radial expansion and plastic deformation. In an exemplary embodiment, D_{PE} is greater than D_{AE}, and YS_{AE} is greater than YS_{PE}. In this manner, the first expandable tubular member 12 and/or the second expandable tubular member 14 are transformed during the radial expansion and plastic deformation process. Furthermore, in this manner, in an exemplary embodiment, the amount of power and/or energy required to radially expand each unit length of the first and/or second expandable tubular members, 12 and 14, is reduced. Furthermore, because the YS_{AE} is greater than YS_{PE}, the collapse strength of the first expandable tubular member 12 and/or the second expandable tubular member 14 is increased after the radial expansion and plastic deformation process.

[0116] In an exemplary embodiment, as illustrated in Fig. 7, following the completion of the radial expansion and plastic deformation of the expandable tubular assembly 10 described above with reference to Figs. 1-4, at least a portion of the second expandable tubular member 14 has an inside diameter that is greater than at least the inside diameter of the first expandable tubular member 12.

In this manner a bell-shaped section is formed using at least a portion of the second expandable tubular member 14. Another expandable tubular assembly 22 that includes a first expandable tubular member 24 and a second expandable tubular member 26 may then be positioned in overlapping relation to the first expandable tubular assembly 10 and radially expanded and plastically deformed using the methods described above with reference to Figs. 1-4. Furthermore, following the completion of the radial expansion and plastic deformation of the expandable tubular assembly 20, in an exemplary embodiment, at least a portion of the second expandable tubular member 26 has an inside diameter that is greater than at least the inside diameter of the first expandable tubular member 24. In this manner a bell-shaped section is formed using at least a portion of the second expandable tubular member 26. Furthermore, in this manner, a mono-diameter tubular assembly is formed that defines an internal passage 28 having a substantially constant cross-sectional area and/or inside diameter.

[0117] Referring to Fig. 8, an exemplary embodiment of an expandable tubular assembly 100 includes a first expandable tubular member 102 coupled to a tubular coupling 104. The tubular coupling 104 is coupled to a tubular coupling 106. The tubular coupling 106 is coupled to a second expandable tubular member 108. In several exemplary embodiments, the tubular couplings, 104 and 106, provide a tubular coupling assembly for coupling the first and second expandable tubular members, 102 and 108, together that may include, for example, a conventional mechanical coupling, a welded connection, a brazed connection, a threaded connection, and/or an interference fit connection. In an exemplary embodiment, the first and second expandable tubular members 12 have a plastic yield point YP_1, and the tubular couplings, 104 and 106, have a plastic yield point YP_2. In an exemplary embodiment, the expandable tubular assembly 100 is positioned within a preexisting structure such as, for example, a wellbore 110 that traverses a subterranean formation 112.

[0118] As illustrated in Fig. 9, an expansion device 114 may then be positioned within the second expandable tubular member 108. In several exemplary embodiments, the expansion device 114 may include, for example, one or more of the following conventional expansion devices: a) an expansion cone; b) a rotary expansion device; c) a hydroforming expansion device; d) an impulsive force expansion device; d) any one of the expansion devices commercially available from, or disclosed in any of the published patent applications or issued patents, of Weatherford International, Baker Hughes, Halliburton Energy Services, Shell Oil Co., Schlumberger, and/or Enventure Global Technology L.L.C. In several exemplary embodiments, the expansion device 114 is positioned within the second expandable tubular member 108 before, during, or after the placement of the expandable tubular assembly 100 within the preexisting structure 110.

[0119] As illustrated in Fig. 10, the expansion device 114 may then be operated to radially expand and plastically deform at least a portion of the second expandable tubular member 108 to form a bell-shaped section.

[0120] As illustrated in Fig. 11, the expansion device 114 may then be operated to radially expand and plastically deform the remaining portion of the second expandable tubular member 108, the tubular couplings, 104 and 106, and at least a portion of the first expandable tubular member 102.

[0121] In an exemplary embodiment, at least a portion of at least a portion of at least one of the

first and second expandable tubular members, 102 and 108, are radially expanded into intimate contact with the interior surface of the preexisting structure 110.

[0122] In an exemplary embodiment, as illustrated in Fig. 12, the plastic yield point YP_1 is less than the plastic yield point YP_2. In this manner, in an exemplary embodiment, the amount of power and/or energy required to radially expand each unit length of the first and second expandable tubular members, 102 and 108, is less than the amount of power and/or energy required to radially expand each unit length of the tubular couplings, 104 and 106.

[0123] In an exemplary embodiment, as illustrated in Fig. 13, the first expandable tubular member 12 and/or the second expandable tubular member 14 have a ductility D_{PE} and a yield strength YS_{PE} prior to radial expansion and plastic deformation, and a ductility D_{AE} and a yield strength YS_{AE} after radial expansion and plastic deformation. In an exemplary embodiment, D_{PE} is greater than D_{AE}, and YS_{AE} is greater than YS_{PE}. In this manner, the first expandable tubular member 12 and/or the second expandable tubular member 14 are transformed during the radial expansion and plastic deformation process. Furthermore, in this manner, in an exemplary embodiment, the amount of power and/or energy required to radially expand each unit length of the first and/or second expandable tubular members, 12 and 14, is reduced. Furthermore, because the YS_{AE} is greater than YS_{PE}, the collapse strength of the first expandable tubular member 12 and/or the second expandable tubular member 14 is increased after the radial expansion and plastic deformation process.

[0124] Referring to Fig. 14, an exemplary embodiment of an expandable tubular assembly 200 includes a first expandable tubular member 202 coupled to a second expandable tubular member 204 that defines radial openings 204a, 204b, 204c, and 204d. In several exemplary embodiments, the ends of the first and second expandable tubular members, 202 and 204, are coupled using, for example, a conventional mechanical coupling, a welded connection, a brazed connection, a threaded connection, and/or an interference fit connection. In an exemplary embodiment, one or more of the radial openings, 204a, 204b, 204c, and 204d, have circular, oval, square, and/or irregular cross sections and/or include portions that extend to and interrupt either end of the second expandable tubular member 204. In an exemplary embodiment, the expandable tubular assembly 200 is positioned within a preexisting structure such as, for example, a wellbore 206 that traverses a subterranean formation 208.

[0125] As illustrated in Fig. 15, an expansion device 210 may then be positioned within the second expandable tubular member 204. In several exemplary embodiments, the expansion device 210 may include, for example, one or more of the following conventional expansion devices: a) an expansion cone; b) a rotary expansion device; c) a hydroforming expansion device; d) an impulsive force expansion device; d) any one of the expansion devices commercially available from, or disclosed in any of the published patent applications or issued patents, of Weatherford International, Baker Hughes, Halliburton Energy Services, Shell Oil Co., Schlumberger, and/or Enventure Global Technology L.L.C. In several exemplary embodiments, the expansion device 210 is positioned within the second expandable tubular member 204 before, during, or after the placement of the expandable tubular assembly 200 within the preexisting structure 206.

[0126] As illustrated in Fig. 16, the expansion device 210 may then be operated to radially

expand and plastically deform at least a portion of the second expandable tubular member 204 to form a bell-shaped section.

[0127] As illustrated in Fig. 16, the expansion device 20 may then be operated to radially expand and plastically deform the remaining portion of the second expandable tubular member 204 and at least a portion of the first expandable tubular member 202.

[0128] In an exemplary embodiment, the anisotropy ratio AR for the first and second expandable tubular members is defined by the following equation:

$AR = \ln (WT_f/WT_o)/\ln (D_f/D_o)$;

where AR = anisotropy ratio;

where WT_f = final wall thickness of the expandable tubular member following the radial expansion and plastic deformation of the expandable tubular member;

where WT_i = initial wall thickness of the expandable tubular member prior to the radial expansion and plastic deformation of the expandable tubular member;

where D_f = final inside diameter of the expandable tubular member following the radial expansion and plastic deformation of the expandable tubular member; and

where D_i = initial inside diameter of the expandable tubular member prior to the radial expansion and plastic deformation of the expandable tubular member.

[0129] In an exemplary embodiment, the anisotropy ratio AR for the first and/or second expandable tubular members, 204 and 204, is greater than 1.

[0130] In an exemplary experimental embodiment, the second expandable tubular member 204 had an anisotropy ratio AR greater than 1, and the radial expansion and plastic deformation of the second expandable tubular member did not result in any of the openings, 204a, 204b, 204c, and 204d, splitting or otherwise fracturing the remaining portions of the second expandable tubular member. This was an unexpected result.

[0131] Referring to Fig. 18, in an exemplary embodiment, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 are processed using a method 300 in which a tubular member in an initial state is thermo-mechanically processed in step 302. In an exemplary embodiment, the thermo-mechanical processing 302 includes one or more heat treating and/or mechanical forming processes. As a result, of the thermo-mechanical processing 302, the tubular member is transformed to an intermediate state. The tubular member is then further thermo-mechanically processed in step 304. In an exemplary embodiment, the thermo-mechanical processing 304 includes one or more heat treating and/or mechanical forming processes. As a result, of the thermo-mechanical processing 304, the tubular member is transformed to a final state.

[0132] In an exemplary embodiment, as illustrated in Fig. 19, during the operation of the method 300, the tubular member has a ductility D_{PE} and a yield strength YS_{PE} prior to the final thermo-mechanical processing in step 304, and a ductility D_{AE} and a yield strength YS_{AE} after final thermo-mechanical processing. In an exemplary embodiment, D_{PE} is greater than D_{AE}, and YS_{AE} is greater than YS_{PE}. In this manner, the amount of energy and/or power required to transform the tubular member, using mechanical forming processes, during the final thermo-mechanical processing in step 304 is reduced. Furthermore, in this manner, because the YS_{AE} is greater than YS_{PE}, the collapse

strength of the tubular member is increased after the final thermo-mechanical processing in step 304.

[0133] In an exemplary embodiment, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204, have the following characteristics:

Characteristic	Value
Tensile Strength	60 to 120 ksi
Yield Strength	50 to 100 ksi
Y/T Ratio	Maximum of 50/85 %
Elongation During Radial Expansion and Plastic Deformation	Minimum of 35 %
Width Reduction During Radial Expansion and Plastic Deformation	Minimum of 40 %
Wall Thickness Reduction During Radial Expansion and Plastic Deformation	Minimum of 30 %
Anisotropy	Minimum of 1.5
Minimum Absorbed Energy at -4 F (-20 C) in the Longitudinal Direction	80 ft-lb
Minimum Absorbed Energy at -4 F (-20 C) in the Transverse Direction	60 ft-lb
Minimum Absorbed Energy at -4 F (-20 C) Transverse To A Weld Area	60 ft-lb
Flare Expansion Testing	Minimum of 75% Without A Failure
Increase in Yield Strength Due To Radial Expansion and Plastic Deformation	Greater than 5.4 %

[0134] In an exemplary embodiment, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204, are characterized by an expandability coefficient f:

i. f = r X n

ii. where f = expandability coefficient;

1. r = anisotropy coefficient; and
2. n = strain hardening exponent.

[0135] In an exemplary embodiment, the anisotropy coefficient for one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 is greater than 1. In an exemplary embodiment, the strain hardening exponent for one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 is greater than 0.12. In an exemplary embodiment, the expandability coefficient for one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 is greater than 0.12.

[0136] In an exemplary embodiment, a tubular member having a higher expandability coefficient requires less power and/or energy to radially expand and plastically deform each unit length than a tubular member having a lower expandability coefficient. In an exemplary embodiment, a tubular member having a higher expandability coefficient requires less power and/or energy per unit length to radially expand and plastically deform than a tubular member having a lower expandability coefficient.

[0137] In several exemplary experimental embodiments, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204, are steel alloys having one of the following compositions:

	Element and Percentage By Weight							
Steel Alloy	**C**	**Mn**	**P**	**S**	**Si**	**Cu**	**Ni**	**Cr**
A	0.065	1.44	0.01	0.002	0.24	0.01	0.01	0.02
B	0.18	1.28	0.017	0.004	0.29	0.01	0.01	0.03
C	0.08	0.82	0.006	0.003	0.30	0.16	0.05	0.05
D	0.02	1.31	0.02	0.001	0.45	-	9.1	18.7

[0138] In exemplary experimental embodiment, as illustrated in Fig. 20, a sample of an expandable tubular member composed of Alloy A exhibited a yield point before radial expansion and plastic deformation YP_{BE}, a yield point after radial expansion and plastic deformation of about 16 % $YP_{AE16\%}$, and a yield point after radial expansion and plastic deformation of about 24 % $YP_{AE24\%}$. In an exemplary experimental embodiment, $YP_{AE24\%} > YP_{AE16\%} > YP_{BE}$. Furthermore, in an exemplary experimental embodiment, the ductility of the sample of the expandable tubular member composed of Alloy A also exhibited a higher ductility prior to radial expansion and plastic deformation than after radial expansion and plastic deformation. These were unexpected results.

[0139] In an exemplary experimental embodiment, a sample of an expandable tubular member composed of Alloy A exhibited the following tensile characteristics before and after radial expansion and plastic deformation:

	Yield Point ksi	Yield Ratio	Elongation %	Width Reduction %	Wall Thickness Reduction %	Anisotropy
Before Radial Expansion and Plastic Deformation	46.9	0.69	53	-52	55	0.93
After 16% Radial Expansion	65.9	0.83	17	42	51	0.78
After 24% Radial Expansion	68.5	0.83	5	44	54	0.76
% Increase	40% for 16% radial expansion 46% for 24% radial expansion					

[0140] In exemplary experimental embodiment, as illustrated in Fig. 21, a sample of an expandable tubular member composed of Alloy B exhibited a yield point before radial expansion and plastic deformation YP_{BE}, a yield point after radial expansion and plastic deformation of about 16 % $YP_{AE16\%}$, and a yield point after radial expansion and plastic deformation of about 24 % $YP_{AE24\%}$. In an

exemplary embodiment, $YP_{AE24\%} > YP_{AE16\%} > YP_{BE}$. Furthermore, in an exemplary experimental embodiment, the ductility of the sample of the expandable tubular member composed of Alloy B also exhibited a higher ductility prior to radial expansion and plastic deformation than after radial expansion and plastic deformation. These were unexpected results.

[0141] In an exemplary experimental embodiment, a sample of an expandable tubular member composed of Alloy B exhibited the following tensile characteristics before and after radial expansion and plastic deformation:

	Yield Point ksi	Yield Ratio	Elongation %	Width Reduction %	Wall Thickness Reduction %	Anisotropy
Before Radial Expansion and Plastic Deformation	57.8	0.71	44	43	46	0.93
After 16% Radial Expansion	74.4	0.84	16	38	42	0.87
After 24% Radial Expansion	79.8	0.86	20	36	42	0.81
% Increase	28.7% increase for 16% radial expansion 38% increase for 24% radial expansion					

[0142] In an exemplary experimental embodiment, samples of expandable tubulars composed of Alloys A, B, C, and D exhibited the following tensile characteristics prior to radial expansion and plastic deformation:

Steel Alloy	Yield ksi	Yield Ratio	Elongation %	Anisotropy	Absorbed Energy ft-lb	Expandability Coefficient
A	47.6	0.71	44	1.48	145	
B	57.8	0.71	44	1.04	62.2	
C	61.7	0.80	39	1.92	268	
D	48	0.55	56	1.34	-	

[0143] In an exemplary embodiment, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 have a strain hardening exponent greater than 0.12, and a yield ratio is less than 0.85.

[0144] In an exemplary embodiment, the carbon equivalent C_e, for tubular members having a carbon content (by weight percentage) less than or equal to 0.12%, is given by the following expression:

$$C_e = C + Mn/6 + (Cr + Mo + V + Ti + Nb)/5 + (Ni + Cu)/15$$

where C_e = carbon equivalent value;

b. C = carbon percentage by weight;

c. Mn = manganese percentage by weight;

d. Cr = chromium percentage by weight;

e. Mo = molybdenum percentage by weight;

f. V = vanadium percentage by weight;

g. Ti = titanium percentage by weight;

h. Nb = niobium percentage by weight;

i. Ni = nickel percentage by weight; and

j. Cu = copper percentage by weight.

[0145] In an exemplary embodiment, the carbon equivalent value C_e, for tubular members having a carbon content less than or equal to 0.12% (by weight), for one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 is less than 0.21.

[0146] In an exemplary embodiment, the carbon equivalent C_e, for tubular members having more than 0.12% carbon content (by weight), is given by the following expression:

$$C_e = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/60 + Mo/15 + V/10 + 5 * B$$

where C_e = carbon equivalent value;

k. C = carbon percentage by weight;

l. Si = silicon percentage by weight;

m. Mn = manganese percentage by weight;

n. Cu = copper percentage by weight;

o. Cr = chromium percentage by weight;

p. Ni = nickel percentage by weight;

q. Mo = molybdenum percentage by weight;

r. V = vanadium percentage by weight; and

s. B = boron percentage by weight.

[0147] In an exemplary embodiment, the carbon equivalent value C_e, for tubular members having greater than 0.12% carbon content (by weight), for one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 is less than 0.36.

[0148] Referring to Fig. 22 in an exemplary embodiment, a first tubular member 2210 includes an internally threaded connection 2212 at an end portion 2214. A first end of a tubular sleeve 2216 that includes an internal flange 2218 having a tapered portion 2220, and a second end that includes a tapered portion 2222, is then mounted upon and receives the end portion 2214 of the first tubular member 2210. In an exemplary embodiment, the end portion 2214 of the first tubular member 2210 abuts one side of the internal flange 2218 of the tubular sleeve 2216, and the internal diameter of the internal flange 2218 of the tubular sleeve 2216 is substantially equal to or greater than the maximum internal diameter of the internally threaded connection 2212 of the end portion 2214 of the first tubular member 2210. An externally threaded connection 2224 of an end portion 2226 of a second tubular

member 2228 having an annular recess 2230 is then positioned within the tubular sleeve 2216 and threadably coupled to the internally threaded connection 2212 of the end portion 2214 of the first tubular member 2210. In an exemplary embodiment, the internal flange 2218 of the tubular sleeve 2216 mates with and is received within the annular recess 2230 of the end portion 2226 of the second tubular member 2228. Thus, the tubular sleeve 2216 is coupled to and surrounds the external surfaces of the first and second tubular members, 2210 and 2228.

[0149] The internally threaded connection 2212 of the end portion 2214 of the first tubular member 2210 is a box connection, and the externally threaded connection 2224 of the end portion 2226 of the second tubular member 2228 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2216 is at least approximately .020" greater than the outside diameters of the first and second tubular members, 2210 and 2228. In this manner, during the threaded coupling of the first and second tubular members, 2210 and 2228, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0150] As illustrated in Fig. 22, the first and second tubular members, 2210 and 2228, and the tubular sleeve 2216 may be positioned within another structure 2232 such as, for example, a cased or uncased wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating a conventional expansion device 2234 within and/or through the interiors of the first and second tubular members. The tapered portions, 2220 and 2222, of the tubular sleeve 2216 facilitate the insertion and movement of the first and second tubular members within and through the structure 2232, and the movement of the expansion device 2234 through the interiors of the first and second tubular members, 2210 and 2228, may be, for example, from top to bottom or from bottom to top.

[0151] During the radial expansion and plastic deformation of the first and second tubular members, 2210 and 2228, the tubular sleeve 2216 is also radially expanded and plastically deformed. As a result, the tubular sleeve 2216 may be maintained in circumferential tension and the end portions, 2214 and 2226, of the first and second tubular members, 2210 and 2228, may be maintained in circumferential compression.

[0152] Sleeve 2216 increases the axial compression loading of the connection between tubular members 2210 and 2228 before and after expansion by the expansion device 2234. Sleeve 2216 may, for example, be secured to tubular members 2210 and 2228 by a heat shrink fit.

[0153] In several alternative embodiments, the first and second tubular members, 2210 and 2228, are radially expanded and plastically deformed using other conventional methods for radially expanding and plastically deforming tubular members such as, for example, internal pressurization, hydroforming, and/or roller expansion devices and/or any one or combination of the conventional commercially available expansion products and services available from Baker Hughes, Weatherford International, and/or Enventure Global Technology L.L.C.

[0154] The use of the tubular sleeve 2216 during (a) the coupling of the first tubular member 2210 to the second tubular member 2228, (b) the placement of the first and second tubular members in the structure 2232, and (c) the radial expansion and plastic deformation of the first and second tubular members provides a number of significant benefits. For example, the tubular sleeve 2216 protects the exterior surfaces of the end portions, 2214 and 2226, of the first and second tubular

members, 2210 and 2228, during handling and insertion of the tubular members within the structure 2232. In this manner, damage to the exterior surfaces of the end portions, 2214 and 2226, of the first and second tubular members, 2210 and 2228, is avoided that could otherwise result in stress concentrations that could cause a catastrophic failure during subsequent radial expansion operations. Furthermore, the tubular sleeve 2216 provides an alignment guide that facilitates the insertion and threaded coupling of the second tubular member 2228 to the first tubular member 2210. In this manner, misalignment that could result in damage to the threaded connections, 2212 and 2224, of the first and second tubular members, 2210 and 2228, may be avoided. In addition, during the relative rotation of the second tubular member with respect to the first tubular member, required during the threaded coupling of the first and second tubular members, the tubular sleeve 2216 provides an indication of to what degree the first and second tubular members are threadably coupled. For example, if the tubular sleeve 2216 can be easily rotated, that would indicate that the first and second tubular members, 2210 and 2228, are not fully threadably coupled and in intimate contact with the internal flange 2218 of the tubular sleeve. Furthermore, the tubular sleeve 2216 may prevent crack propagation during the radial expansion and plastic deformation of the first and second tubular members, 2210 and 2228. In this manner, failure modes such as, for example, longitudinal cracks in the end portions, 2214 and 2226, of the first and second tubular members may be limited in severity or eliminated all together. In addition, after completing the radial expansion and plastic deformation of the first and second tubular members, 2210 and 2228, the tubular sleeve 2216 may provide a fluid tight metal-to-metal seal between interior surface of the tubular sleeve 2216 and the exterior surfaces of the end portions, 2214 and 2226, of the first and second tubular members. In this manner, fluidic materials are prevented from passing through the threaded connections, 2212 and 2224, of the first and second tubular members, 2210 and 2228, into the annulus between the first and second tubular members and the structure 2232. Furthermore, because, following the radial expansion and plastic deformation of the first and second tubular members, 2210 and 2228, the tubular sleeve 2216 may be maintained in circumferential tension and the end portions, 2214 and 2226, of the first and second tubular members, 2210 and 2228, may be maintained in circumferential compression, axial loads and/or torque loads may be transmitted through the tubular sleeve.

[0155] In several exemplary embodiments, one or more portions of the first and second tubular members, 2210 and 2228, and the tubular sleeve 2216 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0156] Referring to Fig. 23, in an exemplary embodiment, a first tubular member 210 includes an internally threaded connection 2312 at an end portion 2314. A first end of a tubular sleeve 2316 includes an internal flange 2318 and a tapered portion 2320. A second end of the sleeve 2316 includes an internal flange 2321 and a tapered portion 2322. An externally threaded connection 2324 of an end portion 2326 of a second tubular member 2328 having an annular recess 2330, is then positioned within the tubular sleeve 2316 and threadably coupled to the internally threaded connection 2312 of the end portion 2314 of the first tubular member 2310. The internal flange 2318 of the sleeve 2316 mates with and is received within the annular recess 2330.

[0157] The first tubular member 2310 includes a recess 2331. The internal flange 2321 mates with and is received within the annular recess 2331. Thus, the sleeve 2316 is coupled to and surrounds the external surfaces of the first and second tubular members 2310 and 2328.

[0158] The internally threaded connection 2312 of the end portion 2314 of the first tubular member 2310 is a box connection, and the externally threaded connection 2324 of the end portion 2326 of the second tubular member 2328 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2316 is at least approximately .020" greater than the outside diameters of the first and second tubular members 2310 and 2328. In this manner, during the threaded coupling of the first and second tubular members 2310 and 2328, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0159] As illustrated in Fig. 23, the first and second tubular members 2310 and 2328, and the tubular sleeve 2316 may then be positioned within another structure 2332 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 2334 through and/or within the interiors of the first and second tubular members. The tapered portions 2320 and 2322, of the tubular sleeve 2316 facilitates the insertion and movement of the first and second tubular members within and through the structure 2332, and the displacement of the expansion device 2334 through the interiors of the first and second tubular members 2310 and 2328, may be from top to bottom or from bottom to top.

[0160] During the radial expansion and plastic deformation of the first and second tubular members 2310 and 2328, the tubular sleeve 2316 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2316 may be maintained in circumferential tension and the end portions 2314 and 2326, of the first and second tubular members 2310 and 2328, may be maintained in circumferential compression.

[0161] Sleeve 2316 increases the axial tension loading of the connection between tubular members 2310 and 2328 before and after expansion by the expansion device 2334. Sleeve 2316 may be secured to tubular members 2310 and 2328 by a heat shrink fit.

[0162] In several exemplary embodiments, one or more portions of the first and second tubular members, 2310 and 2328, and the tubular sleeve 2316 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0163] Referring to Fig. 24, in an exemplary embodiment, a first tubular member 2410 includes an internally threaded connection 2412 at an end portion 2414. A first end of a tubular sleeve 2416 includes an internal flange 2418 and a tapered portion 2420. A second end of the sleeve 2416 includes an internal flange 2421 and a tapered portion 2422. An externally threaded connection 2424 of an end portion 2426 of a second tubular member 2428 having an annular recess 2430, is then positioned within the tubular sleeve 2416 and threadably coupled to the internally threaded connection 2412 of the end portion 2414 of the first tubular member 2410. The internal flange 2418 of the sleeve 2416 mates with and is received within the annular recess 2430. The first tubular member 2410 includes a recess 2431. The internal flange 2421 mates with and is received within the annular recess 2431. Thus, the sleeve 2416 is coupled to and surrounds the external surfaces of the first and second tubular members 2410 and 2428.

[0164] The internally threaded connection 2412 of the end portion 2414 of the first tubular member 2410 is a box connection, and the externally threaded connection 2424 of the end portion 2426 of the second tubular member 2428 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2416 is at least approximately .020" greater than the outside diameters of the first and second tubular members 2410 and 2428. In this manner, during the threaded coupling of the first and second tubular members 2410 and 2428, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0165] As illustrated in Fig. 24, the first and second tubular members 2410 and 2428, and the tubular sleeve 2416 may then be positioned within another structure 2432 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 2434 through and/or within the interiors of the first and second tubular members. The tapered portions 2420 and 2422, of the tubular sleeve 2416 facilitate the insertion and movement of the first and second tubular members within and through the structure 2432, and the displacement of the expansion device 2434 through the interiors of the first and second tubular members, 2410 and 2428, may be from top to bottom or from bottom to top.

[0166] During the radial expansion and plastic deformation of the first and second tubular members, 2410 and 2428, the tubular sleeve 2416 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2416 may be maintained in circumferential tension and the end portions, 2414 and 2426, of the first and second tubular members, 2410 and 2428, may be maintained in circumferential compression.

[0167] The sleeve 2416 increases the axial compression and tension loading of the connection between tubular members 2410 and 2428 before and after expansion by expansion device 2424. Sleeve 2416 may be secured to tubular members 2410 and 2428 by a heat shrink fit.

[0168] In several exemplary embodiments, one or more portions of the first and second tubular members, 2410 and 2428, and the tubular sleeve 2416 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0169] Referring to Fig. 25, in an exemplary embodiment, a first tubular member 2510 includes an internally threaded connection 2512 at an end portion 2514. A first end of a tubular sleeve 2516 includes an internal flange 2518 and a relief 2520. A second end of the sleeve 2516 includes an internal flange 2521 and a relief 2522. An externally threaded connection 2524 of an end portion 2526 of a second tubular member 2528 having an annular recess 2530, is then positioned within the tubular sleeve 2516 and threadably coupled to the internally threaded connection 2512 of the end portion 2514 of the first tubular member 2510. The internal flange 2518 of the sleeve 2516 mates with and is received within the annular recess 2530. The first tubular member 2510 includes a recess 2531. The internal flange 2521 mates with and is received within the annular recess 2531. Thus, the sleeve 2516 is coupled to and surrounds the external surfaces of the first and second tubular members 2510 and 2528.

[0170] The internally threaded connection 2512 of the end portion 2514 of the first tubular member 2510 is a box connection, and the externally threaded connection 2524 of the end portion 2526 of the second tubular member 2528 is a pin connection. In an exemplary embodiment, the

internal diameter of the tubular sleeve 2516 is at least approximately .020" greater than the outside diameters of the first and second tubular members 2510 and 2528. In this manner, during the threaded coupling of the first and second tubular members 2510 and 2528, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0171] As illustrated in Fig. 25, the first and second tubular members 2510 and 2528, and the tubular sleeve 2516 may then be positioned within another structure 2532 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 2534 through and/or within the interiors of the first and second tubular members. The reliefs 2520 and 2522 are each filled with a sacrificial material 2540 including a tapered surface 2542 and 2544, respectively. The material 2540 may be a metal or a synthetic, and is provided to facilitate the insertion and movement of the first and second tubular members 2510 and 2528, through the structure 2532. The displacement of the expansion device 2534 through the interiors of the first and second tubular members 2510 and 2528, may, for example, be from top to bottom or from bottom to top.

[0172] During the radial expansion and plastic deformation of the first and second tubular members 2510 and 2528, the tubular sleeve 2516 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2516 may be maintained in circumferential tension and the end portions 2514 and 2526, of the first and second tubular members, 2510 and 2528, may be maintained in circumferential compression.

[0173] The addition of the sacrificial material 2540, provided on sleeve 2516, avoids stress risers on the sleeve 2516 and the tubular member 2510. The tapered surfaces 2542 and 2544 are intended to wear or even become damaged, thus incurring such wear or damage which would otherwise be borne by sleeve 2516. Sleeve 2516 may be secured to tubular members 2510 and 2528 by a heat shrink fit.

[0174] In several exemplary embodiments, one or more portions of the first and second tubular members, 2510 and 2528, and the tubular sleeve 2516 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0175] Referring to Fig. 26, in an exemplary embodiment, a first tubular member 2610 includes an internally threaded connection 2612 at an end portion 2614. A first end of a tubular sleeve 2616 includes an internal flange 2618 and a tapered portion 2620. A second end of the sleeve 2616 includes an internal flange 2621 and a tapered portion 2622. An externally threaded connection 2624 of an end portion 2626 of a second tubular member 2628 having an annular recess 2630, is then positioned within the tubular sleeve 2616 and threadably coupled to the internally threaded connection 2612 of the end portion 2614 of the first tubular member 2610. The internal flange 2618 of the sleeve 2616 mates with and is received within the annular recess 2630.

[0176] The first tubular member 2610 includes a recess 2631. The internal flange 2621 mates with and is received within the annular recess 2631. Thus, the sleeve 2616 is coupled to and surrounds the external surfaces of the first and second tubular members 2610 and 2628.

[0177] The internally threaded connection 2612 of the end portion 2614 of the first tubular member 2610 is a box connection, and the externally threaded connection 2624 of the end portion

2626 of the second tubular member 2628 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2616 is at least approximately .020" greater than the outside diameters of the first and second tubular members 2610 and 2628. In this manner, during the threaded coupling of the first and second tubular members 2610 and 2628, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0178] As illustrated in Fig. 26, the first and second tubular members 2610 and 2628, and the tubular sleeve 2616 may then be positioned within another structure 2632 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 2634 through and/or within the interiors of the first and second tubular members. The tapered portions 2620 and 2622, of the tubular sleeve 2616 facilitates the insertion and movement of the first and second tubular members within and through the structure 2632, and the displacement of the expansion device 2634 through the interiors of the first and second tubular members 2610 and 2628, may, for example, be from top to bottom or from bottom to top.

[0179] During the radial expansion and plastic deformation of the first and second tubular members 2610 and 2628, the tubular sleeve 2616 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2616 may be maintained in circumferential tension and the end portions 2614 and 2626, of the first and second tubular members 2610 and 2628, may be maintained in circumferential compression.

[0180] Sleeve 2616 is covered by a thin walled cylinder of sacrificial material 2640. Spaces 2623 and 2624, adjacent tapered portions 2620 and 2622, respectively, are also filled with an excess of the sacrificial material 2640. The material may be a metal or a synthetic, and is provided to facilitate the insertion and movement of the first and second tubular members 2610 and 2628, through the structure 2632.

[0181] The addition of the sacrificial material 2640, provided on sleeve 2616, avoids stress risers on the sleeve 2616 and the tubular member 2610. The excess of the sacrificial material 2640 adjacent tapered portions 2620 and 2622 are intended to wear or even become damaged, thus incurring such wear or damage which would otherwise be borne by sleeve 2616. Sleeve 2616 may be secured to tubular members 2610 and 2628 by a heat shrink fit.

[0182] In several exemplary embodiments, one or more portions of the first and second tubular members, 2610 and 2628, and the tubular sleeve 2616 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0183] Referring to Fig. 27, in an exemplary embodiment, a first tubular member 2710 includes an internally threaded connection 2712 at an end portion 2714. A first end of a tubular sleeve 2716 includes an internal flange 2718 and a tapered portion 2720. A second end of the sleeve 2716 includes an internal flange 2721 and a tapered portion 2722. An externally threaded connection 2724 of an end portion 2726 of a second tubular member 2728 having an annular recess 2730, is then positioned within the tubular sleeve 2716 and threadably coupled to the internally threaded connection 2712 of the end portion 2714 of the first tubular member 2710. The internal flange 2718 of the sleeve 2716 mates with and is received within the annular recess 2730.

[0184] The first tubular member 2710 includes a recess 2731. The internal flange 2721 mates with and is received within the annular recess 2731. Thus, the sleeve 2716 is coupled to and surrounds the external surfaces of the first and second tubular members 2710 and 2728.

[0185] The internally threaded connection 2712 of the end portion 2714 of the first tubular member 2710 is a box connection, and the externally threaded connection 2724 of the end portion 2726 of the second tubular member 2728 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2716 is at least approximately .020" greater than the outside diameters of the first and second tubular members 2710 and 2728. In this manner, during the threaded coupling of the first and second tubular members 2710 and 2728, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0186] As illustrated in Fig. 27, the first and second tubular members 2710 and 2728, and the tubular sleeve 2716 may then be positioned within another structure 2732 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 2734 through and/or within the interiors of the first and second tubular members. The tapered portions 2720 and 2722, of the tubular sleeve 2716 facilitates the insertion and movement of the first and second tubular members within and through the structure 2732, and the displacement of the expansion device 2734 through the interiors of the first and second tubular members 2710 and 2728, may be from top to bottom or from bottom to top.

[0187] During the radial expansion and plastic deformation of the first and second tubular members 2710 and 2728, the tubular sleeve 2716 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2716 may be maintained in circumferential tension and the end portions 2714 and 2726, of the first and second tubular members 2710 and 2728, may be maintained in circumferential compression.

[0188] Sleeve 2716 has a variable thickness due to one or more reduced thickness portions 2790 and/or increased thickness portions 2792.

[0189] Varying the thickness of sleeve 2716 provides the ability to control or induce stresses at selected positions along the length of sleeve 2716 and the end portions 2724 and 2726. Sleeve 2716 may be secured to tubular members 2710 and 2728 by a heat shrink fit.

[0190] In several exemplary embodiments, one or more portions of the first and second tubular members, 2710 and 2728, and the tubular sleeve 2716 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0191] Referring to Fig. 28, in an alternative embodiment, instead of varying the thickness of sleeve 2716, the same result described above with reference to Fig. 27, may be achieved by adding a member 2740 which may be coiled onto the grooves 2739 formed in sleeve 2716, thus varying the thickness along the length of sleeve 2716.

[0192] Referring to Fig. 29, in an exemplary embodiment, a first tubular member 2910 includes an internally threaded connection 2912 and an internal annular recess 2914 at an end portion 2916. A first end of a tubular sleeve 2918 includes an internal flange 2920, and a second end of the sleeve 2916 mates with and receives the end portion 2916 of the first tubular member 2910. An externally threaded connection 2922 of an end portion 2924 of a second tubular member 2926 having an

annular recess 2928, is then positioned within the tubular sleeve 2918 and threadably coupled to the internally threaded connection 2912 of the end portion 2916 of the first tubular member 2910. The internal flange 2920 of the sleeve 2918 mates with and is received within the annular recess 2928. A sealing element 2930 is received within the internal annular recess 2914 of the end portion 2916 of the first tubular member 2910.

[0193] The internally threaded connection 2912 of the end portion 2916 of the first tubular member 2910 is a box connection, and the externally threaded connection 2922 of the end portion 2924 of the second tubular member 2926 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 2918 is at least approximately .020" greater than the outside diameters of the first tubular member 2910. In this manner, during the threaded coupling of the first and second tubular members 2910 and 2926, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0194] The first and second tubular members 2910 and 2926, and the tubular sleeve 2918 may be positioned within another structure such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device through and/or within the interiors of the first and second tubular members.

[0195] During the radial expansion and plastic deformation of the first and second tubular members 2910 and 2926, the tubular sleeve 2918 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 2918 may be maintained in circumferential tension and the end portions 2916 and 2924, of the first and second tubular members 2910 and 2926, respectively, may be maintained in circumferential compression.

[0196] In an exemplary embodiment, before, during, and after the radial expansion and plastic deformation of the first and second tubular members 2910 and 2926, and the tubular sleeve 2918, the sealing element 2930 seals the interface between the first and second tubular members. In an exemplary embodiment, during and after the radial expansion and plastic deformation of the first and second tubular members 2910 and 2926, and the tubular sleeve 2918, a metal to metal seal is formed between at least one of: the first and second tubular members 2910 and 2926, the first tubular member and the tubular sleeve 2918, and/or the second tubular member and the tubular sleeve. In an exemplary embodiment, the metal to metal seal is both fluid tight and gas tight.

[0197] In several exemplary embodiments, one or more portions of the first and second tubular members, 2910 and 2926, the tubular sleeve 2918, and the sealing element 2930 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0198] Referring to Fig. 30a, in an exemplary embodiment, a first tubular member 3010 includes internally threaded connections 3012a and 3012b, spaced apart by a cylindrical internal surface 3014, at an end portion 3016. Externally threaded connections 3018a and 3018b, spaced apart by a cylindrical external surface 3020, of an end portion 3022 of a second tubular member 3024 are threadably coupled to the internally threaded connections, 3012a and 3012b, respectively, of the end portion 3016 of the first tubular member 3010. A sealing element 3026 is received within an annulus

defined between the internal cylindrical surface 3014 of the first tubular member 3010 and the external cylindrical surface 3020 of the second tubular member 3024.

[0199] The internally threaded connections, 3012a and 3012b, of the end portion 3016 of the first tubular member 3010 are box connections, and the externally threaded connections, 3018a and 3018b, of the end portion 3022 of the second tubular member 3024 are pin connections. In an exemplary embodiment, the sealing element 3026 is an elastomeric and/or metallic sealing element.

[0200]. The first and second tubular members 3010 and 3024 may be positioned within another structure such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device through and/or within the interiors of the first and second tubular members.

[0201] In an exemplary embodiment, before, during, and after the radial expansion and plastic deformation of the first and second tubular members 3010 and 3024, the sealing element 3026 seals the interface between the first and second tubular members. In an exemplary embodiment, before, during and/or after the radial expansion and plastic deformation of the first and second tubular members 3010 and 3024, a metal to metal seal is formed between at least one of: the first and second tubular members 3010 and 3024, the first tubular member and the sealing element 3026, and/or the second tubular member and the sealing element. In an exemplary embodiment, the metal to metal seal is both fluid tight and gas tight.

[0202] In an alternative embodiment, the sealing element 3026 is omitted, and during and/or after the radial expansion and plastic deformation of the first and second tubular members 3010 and 3024, a metal to metal seal is formed between the first and second tubular members.

[0203] In several exemplary embodiments, one or more portions of the first and second tubular members, 3010 and 3024, the sealing element 3026 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0204] Referring to Fig. 30b, in an exemplary embodiment, a first tubular member 3030 includes internally threaded connections 3032a and 3032b, spaced apart by an undulating approximately cylindrical internal surface 3034, at an end portion 3036. Externally threaded connections 3038a and 3038b, spaced apart by a cylindrical external surface 3040, of an end portion 3042 of a second tubular member 3044 are threadably coupled to the internally threaded connections, 3032a and 3032b, respectively, of the end portion 3036 of the first tubular member 3030. A sealing element 3046 is received within an annulus defined between the undulating approximately cylindrical internal surface 3034 of the first tubular member 3030 and the external cylindrical surface 3040 of the second tubular member 3044.

[0205] The internally threaded connections, 3032a and 3032b, of the end portion 3036 of the first tubular member 3030 are box connections, and the externally threaded connections, 3038a and 3038b, of the end portion 3042 of the second tubular member 3044 are pin connections. In an exemplary embodiment, the sealing element 3046 is an elastomeric and/or metallic sealing element.

[0206] The first and second tubular members 3030 and 3044 may be positioned within another structure such as, for example, a wellbore, and radially expanded and plastically deformed, for

example, by displacing and/or rotating an expansion device through and/or within the interiors of the first and second tubular members.

[0207] In an exemplary embodiment, before, during, and after the radial expansion and plastic deformation of the first and second tubular members 3030 and 3044, the sealing element 3046 seals the interface between the first and second tubular members. In an exemplary embodiment, before, during and/or after the radial expansion and plastic deformation of the first and second tubular members 3030 and 3044, a metal to metal seal is formed between at least one of: the first and second tubular members 3030 and 3044, the first tubular member and the sealing element 3046, and/or the second tubular member and the sealing element. In an exemplary embodiment, the metal to metal seal is both fluid tight and gas tight.

[0208] In an alternative embodiment, the sealing element 3046 is omitted, and during and/or after the radial expansion and plastic deformation of the first and second tubular members 3030 and 3044, a metal to metal seal is formed between the first and second tubular members.

[0209] In several exemplary embodiments, one or more portions of the first and second tubular members, 3030 and 3044, the sealing element 3046 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0210] Referring to Fig. 30c, in an exemplary embodiment, a first tubular member 3050 includes internally threaded connections 3052a and 3052b, spaced apart by a cylindrical internal surface 3054 including one or more square grooves 3056, at an end portion 3058. Externally threaded connections 3060a and 3060b, spaced apart by a cylindrical external surface 3062 including one or more square grooves 3064, of an end portion 3066 of a second tubular member 3068 are threadably coupled to the internally threaded connections, 3052a and 3052b, respectively, of the end portion 3058 of the first tubular member 3050. A sealing element 3070 is received within an annulus defined between the cylindrical internal surface 3054 of the first tubular member 3050 and the external cylindrical surface 3062 of the second tubular member 3068.

[0211] The internally threaded connections, 3052a and 3052b, of the end portion 3058 of the first tubular member 3050 are box connections, and the externally threaded connections, 3060a and 3060b, of the end portion 3066 of the second tubular member 3068 are pin connections. In an exemplary embodiment, the sealing element 3070 is an elastomeric and/or metallic sealing element.

[0212] The first and second tubular members 3050 and 3068 may be positioned within another structure such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device through and/or within the interiors of the first and second tubular members.

[0213] In an exemplary embodiment, before, during, and after the radial expansion and plastic deformation of the first and second tubular members 3050 and 3068, the sealing element 3070 seals the interface between the first and second tubular members. In an exemplary embodiment, before, during and/or after the radial expansion and plastic deformation of the first and second tubular members, 3050 and 3068, a metal to metal seal is formed between at least one of: the first and second tubular members, the first tubular member and the sealing element 3070, and/or the second

tubular member and the sealing element. In an exemplary embodiment, the metal to metal seal is both fluid tight and gas tight.

[0214] In an alternative embodiment, the sealing element 3070 is omitted, and during and/or after the radial expansion and plastic deformation of the first and second tubular members 950 and 968, a metal to metal seal is formed between the first and second tubular members.

[0215] In several exemplary embodiments, one or more portions of the first and second tubular members, 3050 and 3068, the sealing element 3070 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0216] Referring to Fig. 31, in an exemplary embodiment, a first tubular member 3110 includes internally threaded connections, 3112a and 3112b, spaced apart by a non-threaded internal surface 3114, at an end portion 3116. Externally threaded connections, 3118a and 3118b, spaced apart by a non-threaded external surface 3120, of an end portion 3122 of a second tubular member 3124 are threadably coupled to the internally threaded connections, 3112a and 3112b, respectively, of the end portion 3122 of the first tubular member 3124.

[0217] First, second, and/or third tubular sleeves, 3126, 3128, and 3130, are coupled the external surface of the first tubular member 3110 in opposing relation to the threaded connection formed by the internal and external threads, 3112a and 3118a, the interface between the non-threaded surfaces, 3114 and 3120, and the threaded connection formed by the internal and external threads, 3112b and 3118b, respectively.

[0218] The internally threaded connections, 3112a and 3112b, of the end portion 3116 of the first tubular member 3110 are box connections, and the externally threaded connections, 3118a and 3118b, of the end portion 3122 of the second tubular member 3124 are pin connections.

[0219] The first and second tubular members 3110 and 3124, and the tubular sleeves 3126, 3128, and/or 3130, may then be positioned within another structure 3132 such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device 3134 through and/or within the interiors of the first and second tubular members.

[0220] During the radial expansion and plastic deformation of the first and second tubular members 3110 and 3124, the tubular sleeves 3126, 3128 and/or 3130 are also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeves 3126, 3128, and/or 3130 are maintained in circumferential tension and the end portions 3116 and 3122, of the first and second tubular members 3110 and 3124, may be maintained in circumferential compression.

[0221] The sleeves 3126, 3128, and/or 3130 may, for example, be secured to the first tubular member 3110 by a heat shrink fit.

[0222] In several exemplary embodiments, one or more portions of the first and second tubular members, 3110 and 3124, and the sleeves, 3126, 3128, and 3130, have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0223] Referring to Fig. 32a, in an exemplary embodiment, a first tubular member 3210 includes an internally threaded connection 3212 at an end portion 3214. An externally threaded connection 3216 of an end portion 3218 of a second tubular member 3220 are threadably coupled to the internally threaded connection 3212 of the end portion 3214 of the first tubular member 3210.

[0224] The internally threaded connection 3212 of the end portion 3214 of the first tubular member 3210 is a box connection, and the externally threaded connection 3216 of the end portion 3218 of the second tubular member 3220 is a pin connection.

[0225] A tubular sleeve 3222 including internal flanges 3224 and 3226 is positioned proximate and surrounding the end portion 3214 of the first tubular member 3210. As illustrated in Fig. 32b, the tubular sleeve 3222 is then forced into engagement with the external surface of the end portion 3214 of the first tubular member 3210 in a conventional manner. As a result, the end portions, 3214 and 3218, of the first and second tubular members, 3210 and 3220, are upset in an undulating fashion.

[0226] The first and second tubular members 3210 and 3220, and the tubular sleeve 3222, may then be positioned within another structure such as, for example, a wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating an expansion device through and/or within the interiors of the first and second tubular members.

[0227] During the radial expansion and plastic deformation of the first and second tubular members 3210 and 3220, the tubular sleeve 3222 is also radially expanded and plastically deformed. In an exemplary embodiment, as a result, the tubular sleeve 3222 is maintained in circumferential tension and the end portions 3214 and 3218, of the first and second tubular members 3210 and 3220, may be maintained in circumferential compression.

[0228] In several exemplary embodiments, one or more portions of the first and second tubular members, 3210 and 3220, and the sleeve 3222 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0229] Referring to Fig. 33, in an exemplary embodiment, a first tubular member 3310 includes an internally threaded connection 3312 and an annular projection 3314 at an end portion 3316.

[0230] A first end of a tubular sleeve 3318 that includes an internal flange 3320 having a tapered portion 3322 and an annular recess 3324 for receiving the annular projection 3314 of the first tubular member 3310, and a second end that includes a tapered portion 3326, is then mounted upon and receives the end portion 3316 of the first tubular member 3310.

[0231] In an exemplary embodiment, the end portion 3316 of the first tubular member 3310 abuts one side of the internal flange 3320 of the tubular sleeve 3318 and the annular projection 3314 of the end portion of the first tubular member mates with and is received within the annular recess 3324 of the internal flange of the tubular sleeve, and the internal diameter of the internal flange 3320 of the tubular sleeve 3318 is substantially equal to or greater than the maximum internal diameter of the internally threaded connection 3312 of the end portion 3316 of the first tubular member 3310. An externally threaded connection 3326 of an end portion 3328 of a second tubular member 3330 having an annular recess 3332 is then positioned within the tubular sleeve 3318 and threadably coupled to the internally threaded connection 3312 of the end portion 3316 of the first tubular member 3310. In an exemplary embodiment, the internal flange 3332 of the tubular sleeve 3318 mates with and is received within the annular recess 3332 of the end portion 3328 of the second tubular member 3330. Thus, the tubular sleeve 3318 is coupled to and surrounds the external surfaces of the first and second tubular members, 3310 and 3328.

[0232] The internally threaded connection 3312 of the end portion 3316 of the first tubular

member 3310 is a box connection, and the externally threaded connection 3326 of the end portion 3328 of the second tubular member 3330 is a pin connection. In an exemplary embodiment, the internal diameter of the tubular sleeve 3318 is at least approximately .020" greater than the outside diameters of the first and second tubular members, 3310 and 3330. In this manner, during the threaded coupling of the first and second tubular members, 3310 and 3330, fluidic materials within the first and second tubular members may be vented from the tubular members.

[0233] As illustrated in Fig. 33, the first and second tubular members, 3310 and 3330, and the tubular sleeve 3318 may be positioned within another structure 3334 such as, for example, a cased or uncased wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating a conventional expansion device 3336 within and/or through the interiors of the first and second tubular members. The tapered portions, 3322 and 3326, of the tubular sleeve 3318 facilitate the insertion and movement of the first and second tubular members within and through the structure 3334, and the movement of the expansion device 3336 through the interiors of the first and second tubular members, 3310 and 3330, may, for example, be from top to bottom or from bottom to top.

[0234] During the radial expansion and plastic deformation of the first and second tubular members, 3310 and 3330, the tubular sleeve 3318 is also radially expanded and plastically deformed. As a result, the tubular sleeve 3318 may be maintained in circumferential tension and the end portions, 3316 and 3328, of the first and second tubular members, 3310 and 3330, may be maintained in circumferential compression.

[0235] Sleeve 3316 increases the axial compression loading of the connection between tubular members 3310 and 3330 before and after expansion by the expansion device 3336. Sleeve 3316 may be secured to tubular members 3310 and 3330, for example, by a heat shrink fit.

[0236] In several alternative embodiments, the first and second tubular members, 3310 and 3330, are radially expanded and plastically deformed using other conventional methods for radially expanding and plastically deforming tubular members such as, for example, internal pressurization, hydroforming, and/or roller expansion devices and/or any one or combination of the conventional commercially available expansion products and services available from Baker Hughes, Weatherford International, and/or Enventure Global Technology L.L.C.

[0237] The use of the tubular sleeve 3318 during (a) the coupling of the first tubular member 3310 to the second tubular member 3330, (b) the placement of the first and second tubular members in the structure 3334, and (c) the radial expansion and plastic deformation of the first and second tubular members provides a number of significant benefits. For example, the tubular sleeve 3318 protects the exterior surfaces of the end portions, 3316 and 3328, of the first and second tubular members, 3310 and 3330, during handling and insertion of the tubular members within the structure 3334. In this manner, damage to the exterior surfaces of the end portions, 3316 and 3328, of the first and second tubular members, 3310 and 3330, is avoided that could otherwise result in stress concentrations that could cause a catastrophic failure during subsequent radial expansion operations. Furthermore, the tubular sleeve 3318 provides an alignment guide that facilitates the insertion and threaded coupling of the second tubular member 3330 to the first tubular member 3310. In this manner, misalignment that could result in damage to the threaded connections, 3312 and 3326, of the

first and second tubular members, 3310 and 3330, may be avoided. In addition, during the relative rotation of the second tubular member with respect to the first tubular member, required during the threaded coupling of the first and second tubular members, the tubular sleeve 3318 provides an indication of to what degree the first and second tubular members are threadably coupled. For example, if the tubular sleeve 3318 can be easily rotated, that would indicate that the first and second tubular members, 3310 and 3330, are not fully threadably coupled and in intimate contact with the internal flange 3320 of the tubular sleeve. Furthermore, the tubular sleeve 3318 may prevent crack propagation during the radial expansion and plastic deformation of the first and second tubular members, 3310 and 3330. In this manner, failure modes such as, for example, longitudinal cracks in the end portions, 3316 and 3328, of the first and second tubular members may be limited in severity or eliminated all together. In addition, after completing the radial expansion and plastic deformation of the first and second tubular members, 3310 and 3330, the tubular sleeve 3318 may provide a fluid tight metal-to-metal seal between interior surface of the tubular sleeve 3318 and the exterior surfaces of the end portions, 3316 and 3328, of the first and second tubular members. In this manner, fluidic materials are prevented from passing through the threaded connections, 3312 and 3326, of the first and second tubular members, 3310 and 3330, into the annulus between the first and second tubular members and the structure 3334. Furthermore, because, following the radial expansion and plastic deformation of the first and second tubular members, 3310 and 3330, the tubular sleeve 3318 may be maintained in circumferential tension and the end portions, 3316 and 3328, of the first and second tubular members, 3310 and 3330, may be maintained in circumferential compression, axial loads and/or torque loads may be transmitted through the tubular sleeve.

[0238] In several exemplary embodiments, one or more portions of the first and second tubular members, 3310 and 3330, and the sleeve 3318 have one or more of the material properties of one or more of the tubular members 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204.

[0239] Referring to Figs. 34a, 34b, and 34c, in an exemplary embodiment, a first tubular member 3410 includes an internally threaded connection 1312 and one or more external grooves 3414 at an end portion 3416.

[0240] A first end of a tubular sleeve 3418 that includes an internal flange 3420 and a tapered portion 3422, a second end that includes a tapered portion 3424, and an intermediate portion that includes one or more longitudinally aligned openings 3426, is then mounted upon and receives the end portion 3416 of the first tubular member 3410.

[0241] In an exemplary embodiment, the end portion 3416 of the first tubular member 3410 abuts one side of the internal flange 3420 of the tubular sleeve 3418, and the internal diameter of the internal flange 3420 of the tubular sleeve 3416 is substantially equal to or greater than the maximum internal diameter of the internally threaded connection 3412 of the end portion 3416 of the first tubular member 3410. An externally threaded connection 3428 of an end portion 3430 of a second tubular member 3432 that includes one or more internal grooves 3434 is then positioned within the tubular sleeve 3418 and threadably coupled to the internally threaded connection 3412 of the end portion 3416 of the first tubular member 3410. In an exemplary embodiment, the internal flange 3420 of the tubular sleeve 3418 mates with and is received within an annular recess 3436 defined in the end

portion 3430 of the second tubular member 3432. Thus, the tubular sleeve 3418 is coupled to and surrounds the external surfaces of the first and second tubular members, 3410 and 3432.

[0242] The first and second tubular members, 3410 and 3432, and the tubular sleeve 3418 may be positioned within another structure such as, for example, a cased or uncased wellbore, and radially expanded and plastically deformed, for example, by displacing and/or rotating a conventional expansion device within and/or through the interiors of the first and second tubular members. The tapered portions, 3422 and 3424, of the tubular sleeve 3418 facilitate the insertion and movement of the first and second tubular members within and through the structure, and the movement of the expansion device through the interiors of the first and second tubular members, 3410 and 3432, may be from top to bottom or from bottom to top.

[0243] During the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432, the tubular sleeve 3418 is also radially expanded and plastically deformed. As a result, the tubular sleeve 3418 may be maintained in circumferential tension and the end portions, 3416 and 3430, of the first and second tubular members, 3410 and 3432, may be maintained in circumferential compression.

[0244] Sleeve 3416 increases the axial compression loading of the connection between tubular members 3410 and 3432 before and after expansion by the expansion device. The sleeve 3418 may be secured to tubular members 3410 and 3432, for example, by a heat shrink fit.

[0245] During the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432, the grooves 3414 and/or 3434 and/or the openings 3426 provide stress concentrations that in turn apply added stress forces to the mating threads of the threaded connections, 3412 and 3428. As a result, during and after the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432, the mating threads of the threaded connections, 3412 and 3428, are maintained in metal to metal contact thereby providing a fluid and gas tight connection. In an exemplary embodiment, the orientations of the grooves 3414 and/or 3434 and the openings 3426 are orthogonal to one another. In an exemplary embodiment, the grooves 3414 and/or 3434 are helical grooves.

[0246] In several alternative embodiments, the first and second tubular members, 3410 and 3432, are radially expanded and plastically deformed using other conventional methods for radially expanding and plastically deforming tubular members such as, for example, internal pressurization, hydroforming, and/or roller expansion devices and/or any one or combination of the conventional commercially available expansion products and services available from Baker Hughes, Weatherford International, and/or Enventure Global Technology L.L.C.

[0247] The use of the tubular sleeve 3418 during (a) the coupling of the first tubular member 3410 to the second tubular member 3432, (b) the placement of the first and second tubular members in the structure, and (c) the radial expansion and plastic deformation of the first and second tubular members provides a number of significant benefits. For example, the tubular sleeve 3418 protects the exterior surfaces of the end portions, 3416 and 3430, of the first and second tubular members, 3410 and 3432, during handling and insertion of the tubular members within the structure. In this manner, damage to the exterior surfaces of the end portions, 3416 and 3430, of the first and second

tubular members, 3410 and 3432, is avoided that could otherwise result in stress concentrations that could cause a catastrophic failure during subsequent radial expansion operations. Furthermore, the tubular sleeve 3418 provides an alignment guide that facilitates the insertion and threaded coupling of the second tubular member 3432 to the first tubular member 3410. In this manner, misalignment that could result in damage to the threaded connections, 3412 and 3428, of the first and second tubular members, 3410 and 3432, may be avoided. In addition, during the relative rotation of the second tubular member with respect to the first tubular member, required during the threaded coupling of the first and second tubular members, the tubular sleeve 3416 provides an indication of to what degree the first and second tubular members are threadably coupled. For example, if the tubular sleeve 3418 can be easily rotated, that would indicate that the first and second tubular members, 3410 and 3432, are not fully threadably coupled and in intimate contact with the internal flange 3420 of the tubular sleeve. Furthermore, the tubular sleeve 3418 may prevent crack propagation during the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432. In this manner, failure modes such as, for example, longitudinal cracks in the end portions, 3416 and 3430, of the first and second tubular members may be limited in severity or eliminated all together. In addition, after completing the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432, the tubular sleeve 3418 may provide a fluid and gas tight metal-to-metal seal between interior surface of the tubular sleeve 3418 and the exterior surfaces of the end portions, 3416 and 3430, of the first and second tubular members. In this manner, fluidic materials are prevented from passing through the threaded connections, 3412 and 3430, of the first and second tubular members, 3410 and 3432, into the annulus between the first and second tubular members and the structure. Furthermore, because, following the radial expansion and plastic deformation of the first and second tubular members, 3410 and 3432, the tubular sleeve 3418 may be maintained in circumferential tension and the end portions, 3416 and 3430, of the first and second tubular members, 3410 and 3432, may be maintained in circumferential compression, axial loads and/or torque loads may be transmitted through the tubular sleeve.

[0248] In several exemplary embodiments, the first and second tubular members described above with reference to Figs. 1 to 34c are radially expanded and plastically deformed using the expansion device in a conventional manner and/or using one or more of the methods and apparatus disclosed in one or more of the following: The present application is related to the following: (1) U.S. patent application serial no. 09/454,139, attorney docket no. 25791.03.02, filed on 12/3/1999, (2) U.S. patent application serial no. 09/510,913, attorney docket no. 25791.7.02, filed on 2/23/2000, (3) U.S. patent application serial no. 09/502,350, attorney docket no. 25791.8.02, filed on 2/10/2000, (4) U.S. patent application serial no. 09/440,338, attorney docket no. 25791.9.02, filed on 11/15/1999, (5) U.S. patent application serial no. 09/523,460, attorney docket no. 25791.11.02, filed on 3/10/2000, (6) U.S. patent application serial no. 09/512,895, attorney docket no. 25791.12.02, filed on 2/24/2000, (7) U.S. patent application serial no. 09/511,941, attorney docket no. 25791.16.02, filed on 2/24/2000, (8) U.S. patent application serial no. 09/588,946, attorney docket no. 25791.17.02, filed on 6/7/2000, (9) U.S. patent application serial no. 09/559,122, attorney docket no. 25791.23.02, filed on 4/26/2000, (10) PCT patent application serial no. PCT/US00/18635, attorney docket no. 25791.25.02, filed on

7/9/2000, (11) U.S. provisional patent application serial no. 60/162,671, attorney docket no. 25791.27, filed on 11/1/1999, (12) U.S. provisional patent application serial no. 60/154,047, attorney docket no. 25791.29, filed on 9/16/1999, (13) U.S. provisional patent application serial no. 60/159,082, attorney docket no. 25791.34, filed on 10/12/1999, (14) U.S. provisional patent application serial no. 60/159,039, attorney docket no. 25791.36, filed on 10/12/1999, (15) U.S. provisional patent application serial no. 60/159,033, attorney docket no. 25791.37, filed on 10/12/1999, (16) U.S. provisional patent application serial no. 60/212,359, attorney docket no. 25791.38, filed on 6/19/2000, (17) U.S. provisional patent application serial no. 60/165,228, attorney docket no. 25791.39, filed on 11/12/1999, (18) U.S. provisional patent application serial no. 60/221,443, attorney docket no. 25791.45, filed on 7/28/2000, (19) U.S. provisional patent application serial no. 60/221,645, attorney docket no. 25791.46, filed on 7/28/2000, (20) U.S. provisional patent application serial no. 60/233,638, attorney docket no. 25791.47, filed on 9/18/2000, (21) U.S. provisional patent application serial no. 60/237,334, attorney docket no. 25791.48, filed on 10/2/2000, (22) U.S. provisional patent application serial no. 60/270,007, attorney docket no. 25791.50, filed on 2/20/2001, (23) U.S. provisional patent application serial no. 60/262,434, attorney docket no. 25791.51, filed on 1/17/2001, (24) U.S, provisional patent application serial no. 60/259,486, attorney docket no. 25791.52, filed on 1/3/2001, (25) U.S. provisional patent application serial no. 60/303,740, attorney docket no. 25791.61, filed on 7/6/2001, (26) U.S. provisional patent application serial no. 60/313,453, attorney docket no. 25791.59, filed on 8/20/2001, (27) U.S. provisional patent application serial no. 60/317,985, attorney docket no. 25791.67, filed on 9/6/2001, (28) U.S. provisional patent application serial no. 60/3318,386, attorney docket no. 25791.67.02, filed on 9/10/2001, (29) U.S. utility patent application serial no. 09/969,922, attorney docket no. 25791.69, filed on 10/3/2001, (30) U.S. utility patent application serial no. 10/016,467, attorney docket no. 25791.70, filed on December 10, 2001, (31) U.S. provisional patent application serial no. 60/343,674, attorney docket no. 25791.68, filed on 12/27/2001; and (32) U.S. provisional patent application serial no. 60/346,309, attorney docket no. 25791.92, filed on 01/07/02, the disclosures of which are incorporated herein by reference.

[0249] Referring to Fig. 35a an exemplary embodiment of an expandable tubular member 3500 includes a first tubular region 3502 and a second tubular portion 3504. In an exemplary embodiment, the material properties of the first and second tubular regions, 3502 and 3504, are different. In an exemplary embodiment, the yield points of the first and second tubular regions, 3502 and 3504, are different. In an exemplary embodiment, the yield point of the first tubular region 3502 is less than the yield point of the second tubular region 3504. In several exemplary embodiments, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202 and/or 204 incorporate the tubular member 3500.

[0250] Referring to Fig. 35b, in an exemplary embodiment, the yield point within the first and second tubular regions, 3502a and 3502b, of the expandable tubular member 3502 vary as a function of the radial position within the expandable tubular member. In an exemplary embodiment, the yield point increases as a function of the radial position within the expandable tubular member 3502. In an exemplary embodiment, the relationship between the yield point and the radial position within the expandable tubular member 3502 is a linear relationship. In an exemplary embodiment, the

relationship between the yield point and the radial position within the expandable tubular member 3502 is a non-linear relationship. In an exemplary embodiment, the yield point increases at different rates within the first and second tubular regions, 3502a and 3502b, as a function of the radial position within the expandable tubular member 3502. In an exemplary embodiment, the functional relationship, and value, of the yield points within the first and second tubular regions, 3502a and 3502b, of the expandable tubular member 3502 are modified by the radial expansion and plastic deformation of the expandable tubular member.

[0251] In several exemplary embodiments, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202, 204 and/or 3502, prior to a radial expansion and plastic deformation, include a microstructure that is a combination of a hard phase, such as martensite, a soft phase, such as ferrite, and a transitionary phase, such as retained austentite. In this manner, the hard phase provides high strength, the soft phase provides ductility, and the transitionary phase transitions to a hard phase, such as martensite, during a radial expansion and plastic deformation. Furthermore, in this manner, the yield point of the tubular member increases as a result of the radial expansion and plastic deformation. Further, in this manner, the tubular member is ductile, prior to the radial expansion and plastic deformation, thereby facilitating the radial expansion and plastic deformation. In an exemplary embodiment, the composition of a dual-phase expandable tubular member includes (weight percentages): about 0.1% C, 1.2% Mn, and 0.3% Si.

[0252] In an exemplary experimental embodiment, as illustrated in Figs. 36a-36c, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202, 204 and/or 3502 are processed in accordance with a method 3600, in which, in step 3602, an expandable tubular member 3602a is provided that is a steel alloy having following material composition (by weight percentage): 0.065% C, 1.44% Mn, 0.01% P, 0.002% S, 0.24% Si, 0.01% Cu, 0.01% Ni, 0.02% Cr, 0.05% V, 0.01%Mo, 0.01% Nb, and 0.01% Ti. In an exemplary experimental embodiment, the expandable tubular member 3602a provided in step 3602 has a yield strength of 45 ksi, and a tensile strength of 69 ksi.

[0253] In an exemplary experimental embodiment, as illustrated in Fig. 36b, in step 3602, the expandable tubular member 3602a includes a microstructure that includes martensite, pearlite, and V, Ni, and/or Ti carbides.

[0254] In an exemplary embodiment, the expandable tubular member 3602a is then heated at a temperature of 790 °C for about 10 minutes in step 3604.

[0255] In an exemplary embodiment, the expandable tubular member 3602a is then quenched in water in step 3606.

[0256] In an exemplary experimental embodiment, as illustrated in Fig. 36c, following the completion of step 3606, the expandable tubular member 3602a includes a microstructure that includes new ferrite, grain pearlite, martensite, and ferrite. In an exemplary experimental embodiment, following the completion of step 3606, the expandable tubular member 3602a has a yield strength of 67 ksi, and a tensile strength of 95 ksi.

[0257] In an exemplary embodiment, the expandable tubular member 3602a is then radially expanded and plastically deformed using one or more of the methods and apparatus described

above. In an exemplary embodiment, following the radial expansion and plastic deformation of the expandable tubular member 3602a, the yield strength of the expandable tubular member is about 95 ksi.

[0258] In an exemplary experimental embodiment, as illustrated in Figs. 37a-37c, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202, 204 and/or 3502 are processed in accordance with a method 3700, in which, in step 3702, an expandable tubular member 3702a is provided that is a steel alloy having following material composition (by weight percentage): 0.18% C, 1.28% Mn, 0.017% P, 0.004% S, 0.29% Si, 0.01% Cu, 0.01% Ni, 0.03% Cr, 0.04% V, 0.01%Mo, 0.03% Nb, and 0.01% Ti. In an exemplary experimental embodiment, the expandable tubular member 3702a provided in step 3702 has a yield strength of 60 ksi, and a tensile strength of 80 ksi.

[0259] In an exemplary experimental embodiment, as illustrated in Fig. 37b, in step 3702, the expandable tubular member 3702a includes a microstructure that includes pearlite and pearlite striation.

[0260] In an exemplary embodiment, the expandable tubular member 3702a is then heated at a temperature of 790 °C for about 10 minutes in step 3704.

[0261] In an exemplary embodiment, the expandable tubular member 3702a is then quenched in water in step 3706.

[0262] In an exemplary experimental embodiment, as illustrated in Fig. 37c, following the completion of step 3706, the expandable tubular member 3702a includes a microstructure that includes ferrite, martensite, and bainite. In an exemplary experimental embodiment, following the completion of step 3706, the expandable tubular member 3702a has a yield strength of 82 ksi, and a tensile strength of 130 ksi.

[0263] In an exemplary embodiment, the expandable tubular member 3702a is then radially expanded and plastically deformed using one or more of the methods and apparatus described above. In an exemplary embodiment, following the radial expansion and plastic deformation of the expandable tubular member 3702a, the yield strength of the expandable tubular member is about 130 ksi.

[0264] In an exemplary experimental embodiment, as illustrated in Figs. 38a-38c, one or more of the expandable tubular members, 12, 14, 24, 26, 102, 104, 106, 108, 202, 204 and/or 3502 are processed in accordance with a method 3800, in which, in step 3802, an expandable tubular member 3802a is provided that is a steel alloy having following material composition (by weight percentage): 0.08% C, 0.82% Mn, 0.006% P, 0.003% S, 0.30% Si, 0.06% Cu, 0.05% Ni, 0.05% Cr, 0.03% V, 0.03%Mo, 0.01% Nb, and 0.01% Ti. In an exemplary experimental embodiment, the expandable tubular member 3802a provided in step 3802 has a yield strength of 56 ksi, and a tensile strength of 75 ksi.

[0265] In an exemplary experimental embodiment, as illustrated in Fig. 38b, in step 3802, the expandable tubular member 3802a includes a microstructure that includes grain pearlite, widmanstatten martensite and carbides of V, Ni, and/or Ti.

[0266] In an exemplary embodiment, the expandable tubular member 3802a is then heated at a temperature of 790 °C for about 10 minutes in step 3804.

[0267] In an exemplary embodiment, the expandable tubular member 3802a is then quenched in water in step 3806.

[0268] In an exemplary experimental embodiment, as illustrated in Fig. 38c, following the completion of step 3806, the expandable tubular member 3802a includes a microstructure that includes bainite, pearlite, and new ferrite. In an exemplary experimental embodiment, following the completion of step 3806, the expandable tubular member 3802a has a yield strength of 60 ksi, and a tensile strength of 97 ksi.

[0269] In an exemplary embodiment, the expandable tubular member 3802a is then radially expanded and plastically deformed using one or more of the methods and apparatus described above. In an exemplary embodiment, following the radial expansion and plastic deformation of the expandable tubular member 3802a, the yield strength of the expandable tubular member is about 97 ksi.

[0270] In several exemplary embodiments, the teachings of the present disclosure are combined with one or more of the teachings disclosed in FR 2 841 626, filed on 6/28/2002, and published on 1/2/2004, the disclosure of which is incorporated herein by reference.

[0271] In an exemplary embodiment, the tubular members include one or more of the following characteristics: high burst and collapse, the ability to be radially expanded more than about 40%, high fracture toughness, defect tolerance, strain recovery @ 150 F, good bending fatigue, optimal residual stresses, and corrosion resistance to H_2S in order to provide optimal characteristics during and after radial expansion and plastic deformation.

[0272] In an exemplary embodiment, the tubular members are fabricated from a steel alloy having a charpy energy of at least about 90 ft-lbs in order to provided enhanced characteristics during and after radial expansion and plastic deformation of the expandable tubular member.

[0273] In an exemplary embodiment, the tubular members are fabricated from a steel alloy having a weight percentage of carbon of less than about 0.08% in order to provide enhanced characteristics during and after radial expansion and plastic deformation of the tubular members.

[0274] In an exemplary embodiment, the tubular members are fabricated from a steel alloy having reduced sulfur content in order to minimize hydrogen induced cracking.

[0275] In an exemplary embodiment, the tubular members are fabricated from a steel alloy having a weight percentage of carbon of less than about 0.20 % and a charpy-V-notch impact toughness of at least about 6 joules in order to provide enhanced characteristics during and after radial expansion and plastic deformation of the tubular members.

[0276] In an exemplary embodiment, the tubular members are fabricated from a steel alloy having a low weight percentage of carbon in order to enhance toughness, ductility, weldability, shelf energy, and hydrogen induced cracking resistance.

[0277] In several exemplary embodiments, the tubular members are fabricated from a steel alloy having the following percentage compositions in order to provide enhanced characteristics during and after radial expansion and plastic deformation of the tubular members:

	C	Si	Mn	P	S	Al	N	Cu	Cr	Ni	Nb	Ti	Co	Mo
EXAMPLE A	0.030	0.22	1.74	0.005	0.0005	0.028	0.0037	0.30	0.26	0.15	0.095	0.014	0.0034	
EXAMPLE B MIN	0.020	0.23	1.70	0.004	0.0005	0.026	0.0030	0.27	0.26	0.16	0.096	0.012	0.0021	
EXAMPLE B MAX	0.032	0.26	1.92	0.009	0.0010	0.035	0.0047	0.32	0.29	0.18	0.120	0.016	0.0050	
EXAMPLE C	0.028	0.24	1.77	0.007	0.0008	0.030	0.0035	0.29	0.27	0.17	0.101	0.014	0.0028	0.0020
EXAMPLE D	0.08	0.30	0.5	0.07	0.005		0.010	0.10	0.50	0.10				
EXAMPLE E	0.0028	0.009	0.17	0.011	0.006	0.027	0.0029		0.029	0.014	0.035	0.007		
EXAMPLE F	0.03	0.1	0.1	0.015	0.005					18.0		0.6	9	5
EXAMPLE G	0.002	0.01	0.15	0.07	0.005	0.04	0.0025				0.015	0.010		

[0278] In an exemplary embodiment, the ratio of the outside diameter D of the tubular members to the wall thickness t of the tubular members range from about 12 to 22 in order to enhance the collapse strength of the radially expanded and plastically deformed tubular members.

[0279] In an exemplary embodiment, the outer portion of the wall thickness of the radially expanded and plastically deformed tubular members includes tensile residual stresses in order to enhance the collapse strength following radial expansion and plastic deformation.

[0280] In several exemplary experimental embodiments, reducing residual stresses in samples of the tubular members prior to radial expansion and plastic deformation increased the collapse strength of the radially expanded and plastically deformed tubular members.

[0281] In several exemplary experimental embodiments, the collapse strength of radially expanded and plastically deformed samples of the tubulars were determined on an as-received basis, after strain aging at 250 F for 5 hours to reduce residual stresses, and after strain aging at 350 F for 14 days to reduce residual stresses as follows:

Tubular Sample	Collapse Strength After 10% Radial Expansion
Tubular Sample 1 – as received from manufacturer	4000 psi
Tubular Sample 1 – strain aged at 250 F for 5 hours to reduce residual stresses	4800 psi
Tubular Sample 1 – strain aged at 350 F for 14 days to reduce residual stresses	5000 psi

[0282] As indicated by the above table, reducing residual stresses in the tubular members, prior to radial expansion and plastic deformation, significantly increased the resulting collapse strength – post expansion.

[0283] A method of forming a tubular liner within a preexisting structure has been described that includes positioning a tubular assembly within the preexisting structure; and radially expanding and plastically deforming the tubular assembly within the preexisting structure, wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly. In an exemplary embodiment, the method further includes positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and radially expanding and plastically deforming the other tubular assembly within the preexisting structure, wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes an end portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a plurality of predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a plurality of spaced apart predetermined portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes an end portion of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes a plurality of other portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes a plurality of spaced apart other portions of the tubular assembly. In an exemplary embodiment, the tubular assembly includes a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings include the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly. In an exemplary embodiment, one or more of the tubular couplings include the predetermined portions of the tubular assembly. In an exemplary embodiment, one or more of the tubular members include the predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly defines one or more openings. In an exemplary embodiment, one or more of the openings include slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the

tubular assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the predetermined portion of the tubular assembly is a first steel alloy including: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a second steel alloy including: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a third steel alloy including: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a fourth steel alloy including: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary

embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly. In an exemplary embodiment, the tubular assembly includes a wellbore casing, a pipeline, or a structural support. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36. In an exemplary embodiment, a yield point of an inner tubular portion of at least a portion of the tubular assembly is less than a yield point of an outer tubular portion of the portion of the tubular assembly. In an exemplary embodiment, yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular

portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body. In an exemplary embodiment, the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body. In an exemplary embodiment, prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure. In an exemplary embodiment, prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a transitional phase structure. In an exemplary embodiment, the hard phase structure comprises martensite. In an exemplary embodiment, the soft phase structure comprises ferrite. In an exemplary embodiment, the transitional phase structure comprises retained austentite. In an exemplary embodiment, the hard phase structure comprises martensite; wherein the soft phase structure comprises ferrite; and wherein the transitional phase structure comprises retained austentite. In an exemplary embodiment, the portion of the tubular assembly comprising a microstructure comprising a hard phase structure and a soft phase structure comprises, by weight percentage, about 0.1% C, about 1.2% Mn, and about 0.3% Si.

[0284] An expandable tubular member has been described that includes a steel alloy including: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, a yield point of the tubular member is at most about 46.9 ksi prior to a radial expansion and plastic deformation; and a yield point of the tubular member is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the tubular member after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the tubular member prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the tubular member, prior to a radial expansion and plastic

deformation, is about 1.48. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0285] An expandable tubular member has been described that includes a steel alloy including: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, a yield point of the tubular member is at most about 57.8 ksi prior to a radial expansion and plastic deformation; and the yield point of the tubular member is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, a yield point of the of the tubular member after a radial expansion and plastic deformation is at least about 28 % greater than the yield point of the tubular member prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0286] An expandable tubular member has been described that includes a steel alloy including: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0287] An expandable tubular member has been described that includes a steel alloy including: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0288] An expandable tubular member has been described, wherein the yield point of the expandable tubular member is at most about 46.9 ksi prior to a radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0289] An expandable tubular member has been described, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 40 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0290] An expandable tubular member has been described, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0291] An expandable tubular member has been described, wherein the yield point of the expandable tubular member is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member

includes a wellbore casing, a pipeline, or a structural support.

[0292] An expandable tubular member has been described, wherein the yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 28 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0293] An expandable tubular member has been described, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0294] An expandable tubular member has been described, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0295] An expandable tubular member has been described, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0296] An expandable tubular member has been described, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0297] An expandable tubular member has been described, wherein the yield point of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0298] An expandable tubular member has been described, wherein the expandability coefficient of the expandable tubular member, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0299] An expandable tubular member has been described, wherein the expandability coefficient of the expandable tubular member is greater than the expandability coefficient of another portion of the expandable tubular member. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0300] An expandable tubular member has been described, wherein the tubular member has a higher ductility and a lower yield point prior to a radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0301] A method of radially expanding and plastically deforming a tubular assembly including a first tubular member coupled to a second tubular member has been described that includes radially

expanding and plastically deforming the tubular assembly within a preexisting structure; and using less power to radially expand each unit length of the first tubular member than to radially expand each unit length of the second tubular member. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0302] A system for radially expanding and plastically deforming a tubular assembly including a first tubular member coupled to a second tubular member has been described that includes means for radially expanding the tubular assembly within a preexisting structure; and means for using less power to radially expand each unit length of the first tubular member than required to radially expand each unit length of the second tubular member. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0303] A method of manufacturing a tubular member has been described that includes processing a tubular member until the tubular member is characterized by one or more intermediate characteristics; positioning the tubular member within a preexisting structure; and processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support. In an exemplary embodiment, the preexisting structure includes a wellbore that traverses a subterranean formation. In an exemplary embodiment, the characteristics are selected from a group consisting of yield point and ductility. In an exemplary embodiment, processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics includes: radially expanding and plastically deforming the tubular member within the preexisting structure.

[0304] An apparatus has been described that includes an expandable tubular assembly; and an expansion device coupled to the expandable tubular assembly; wherein a predetermined portion of the expandable tubular assembly has a lower yield point than another portion of the expandable tubular assembly. In an exemplary embodiment, the expansion device includes a rotary expansion device, an axially displaceable expansion device, a reciprocating expansion device, a hydroforming expansion device, and/or an impulsive force expansion device. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility and a lower yield point than another portion of the expandable tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility than another portion of the expandable tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly has a lower yield point than another portion of the expandable tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes an end portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a plurality of predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a plurality of spaced apart predetermined portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes an end portion of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes a plurality of other portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly includes a plurality of spaced

apart other portions of the tubular assembly. In an exemplary embodiment, the tubular assembly includes a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1 In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a first steel alloy including: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is about 1.48. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a second steel alloy including: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is about 1.04. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a third steel alloy including: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is about 1.92. In an exemplary embodiment, the predetermined portion of the tubular assembly includes a fourth steel alloy including: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is at least about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the tubular

assembly ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly. In an exemplary embodiment, the tubular assembly includes a wellbore casing, a pipeline, or a structural support. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36. In an exemplary embodiment, a yield point of an inner tubular portion of at least a portion of the tubular assembly is less than a yield point of an outer tubular portion of the portion of the tubular assembly. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the rate of change of the yield point of the inner tubular portion of the tubular

body is different than the rate of change of the yield point of the outer tubular portion of the tubular body. In an exemplary embodiment, the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body. In an exemplary embodiment, at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure. In an exemplary embodiment, prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a transitional phase structure. In an exemplary embodiment, wherein the hard phase structure comprises martensite. In an exemplary embodiment, wherein the soft phase structure comprises ferrite. In an exemplary embodiment, wherein the transitional phase structure comprises retained austentite. In an exemplary embodiment, the hard phase structure comprises martensite; wherein the soft phase structure comprises ferrite; and wherein the transitional phase structure comprises retained austentite. In an exemplary embodiment, the portion of the tubular assembly comprising a microstructure comprising a hard phase structure and a soft phase structure comprises, by weight percentage, about 0.1% C, about 1.2% Mn, and about 0.3% Si. In an exemplary embodiment, at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure. In an exemplary embodiment, the portion of the tubular assembly comprises, by weight percentage, 0.065% C, 1.44% Mn, 0.01% P, 0.002% S, 0.24% Si, 0.01% Cu, 0.01% Ni, 0.02% Cr, 0.05% V, 0.01% Mo, 0.01% Nb, and 0.01%Ti. In an exemplary embodiment, the portion of the tubular assembly comprises, by weight percentage, 0.18% C, 1.28% Mn, 0.017% P, 0.004% S, 0.29% Si, 0.01% Cu, 0.01% Ni, 0.03% Cr, 0.04% V, 0.01% Mo, 0.03% Nb, and 0.01%Ti. In an exemplary embodiment, the portion of the tubular assembly comprises, by weight percentage, 0.08% C, 0.82% Mn, 0.006% P, 0.003% S, 0.30% Si, 0.06% Cu, 0.05% Ni, 0.05% Cr, 0.03% V, 0.03% Mo, 0.01% Nb, and 0.01%Ti. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: martensite, pearlite, vanadium carbide, nickel carbide, or titanium carbide. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: pearlite or pearlite striation. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: grain pearlite, widmanstatten martensite, vanadium carbide, nickel carbide, or titanium carbide. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: ferrite, grain pearlite, or martensite. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: ferrite, martensite, or bainite. In an exemplary embodiment, the portion of the tubular assembly comprises a microstructure comprising one or more of the following: bainite, pearlite, or ferrite. In an exemplary embodiment, the portion of the tubular assembly comprises a yield strength of about 67ksi and a tensile strength of about 95 ksi. In an exemplary embodiment, the portion of the tubular assembly comprises a yield strength of about 82 ksi and a tensile strength of about 130 ksi. In an exemplary embodiment, the portion of the tubular assembly comprises a yield strength of about 60 ksi and a tensile strength of about 97 ksi.

[0305] An expandable tubular member has been described, wherein a yield point of the

expandable tubular member after a radial expansion and plastic deformation is at least about 5.8 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0306] A method of determining the expandability of a selected tubular member has been described that includes determining an anisotropy value for the selected tubular member, determining a strain hardening value for the selected tubular member; and multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member. In an exemplary embodiment, an anisotropy value greater than 0.12 indicates that the tubular member is suitable for radial expansion and plastic deformation. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support.

[0307] A method of radially expanding and plastically deforming tubular members has been described that includes selecting a tubular member; determining an anisotropy value for the selected tubular member; determining a strain hardening value for the selected tubular member; multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member; and if the anisotropy value is greater than 0.12, then radially expanding and plastically deforming the selected tubular member. In an exemplary embodiment, the tubular member includes a wellbore casing, a pipeline, or a structural support. In an exemplary embodiment, radially expanding and plastically deforming the selected tubular member includes: inserting the selected tubular member into a preexisting structure; and then radially expanding and plastically deforming the selected tubular member. In an exemplary embodiment, the preexisting structure includes a wellbore that traverses a subterranean formation.

[0308] A radially expandable multiple tubular member apparatus has been described that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; a sleeve overlapping and coupling the first and second tubular members at the joint; the sleeve having opposite tapered ends and a flange engaged in a recess formed in an adjacent tubular member; and one of the tapered ends being a surface formed on the flange. In an exemplary embodiment, the recess includes a tapered wall in mating engagement with the tapered end formed on the flange. In an exemplary embodiment, the sleeve includes a flange at each tapered end and each tapered end is formed on a respective flange. In an exemplary embodiment, each tubular member includes a recess. In an exemplary embodiment, each flange is engaged in a respective one of the recesses. In an exemplary embodiment, each recess includes a tapered wall in mating engagement with the tapered end formed on a respective one of the flanges.

[0309] A method of joining radially expandable multiple tubular members has also been described that includes providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve having opposite tapered ends and a flange, one of the tapered ends being a surface formed on the flange; and mounting the sleeve for overlapping and coupling the first and second tubular members at the joint, wherein the flange is engaged in a recess formed in an adjacent one of the tubular members. In an exemplary embodiment, the method further includes providing a tapered wall in the recess for mating

engagement with the tapered end formed on the flange. In an exemplary embodiment, the method further includes providing a flange at each tapered end wherein each tapered end is formed on a respective flange. In an exemplary embodiment, the method further includes providing a recess in each tubular member. In an exemplary embodiment, the method further includes engaging each flange in a respective one of the recesses. In an exemplary embodiment, the method further includes providing a tapered wall in each recess for mating engagement with the tapered end formed on a respective one of the flanges.

[0310] A radially expandable multiple tubular member apparatus has been described that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; and a sleeve overlapping and coupling the first and second tubular members at the joint; wherein at least a portion of the sleeve is comprised of a frangible material.

[0311] A radially expandable multiple tubular member apparatus has been described that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; and a sleeve overlapping and coupling the first and second tubular members at the joint; wherein the wall thickness of the sleeve is variable.

[0312] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve comprising a frangible material; and mounting the sleeve for overlapping and coupling the first and second tubular members at the joint.

[0313] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve comprising a variable wall thickness; and mounting the sleeve for overlapping and coupling the first and second tubular members at the joint.

[0314] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; and means for increasing the axial compression loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

[0315] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; and means for increasing the axial tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

[0316] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; and means for increasing the axial compression and tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

[0317] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; and means for avoiding stress risers in the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

[0318] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; and means for inducing stresses at selected portions of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

[0319] In several exemplary embodiments of the apparatus described above, the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

[0320] In several exemplary embodiments of the method described above, the method further includes maintaining the sleeve in circumferential tension; and maintaining the first and second tubular members in circumferential compression before, during, and/or after the radial expansion and plastic deformation of the first and second tubular members.

[0321] An expandable tubular assembly has been described that includes a first tubular member, a second tubular member coupled to the first tubular member, a first threaded connection for coupling a portion of the first and second tubular members, a second threaded connection spaced apart from the first threaded connection for coupling another portion of the first and second tubular members, a tubular sleeve coupled to and receiving end portions of the first and second tubular members, and a sealing element positioned between the first and second spaced apart threaded connections for sealing an interface between the first and second tubular member, wherein the sealing element is positioned within an annulus defined between the first and second tubular members. In an exemplary embodiment, the annulus is at least partially defined by an irregular surface. In an exemplary embodiment, the annulus is at least partially defined by a toothed surface. In an exemplary embodiment, the sealing element comprises an elastomeric material. In an exemplary embodiment, the sealing element comprises a metallic material. In an exemplary embodiment, the sealing element comprises an elastomeric and a metallic material.

[0322] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member, providing a second tubular member, providing a sleeve, mounting the sleeve for overlapping and coupling the first and second tubular members, threadably coupling the first and second tubular members at a first location, threadably coupling the first and second tubular members at a second location spaced apart from the first location, and sealing an interface between the first and second tubular members between the first and second locations using a compressible sealing element. In an exemplary embodiment, the sealing element includes an irregular surface. In an exemplary embodiment, the sealing element includes a toothed surface. In an exemplary embodiment, the sealing element comprises an elastomeric material. In an exemplary embodiment, the sealing element comprises a metallic material. In an exemplary embodiment, the sealing element comprises an elastomeric and a metallic material.

[0323] An expandable tubular assembly has been described that includes a first tubular member, a second tubular member coupled to the first tubular member, a first threaded connection for coupling a portion of the first and second tubular members, a second threaded connection spaced apart from the first threaded connection for coupling another portion of the first and second tubular members, and a plurality of spaced apart tubular sleeves coupled to and receiving end portions of the first and

second tubular members. In an exemplary embodiment, at least one of the tubular sleeves is positioned in opposing relation to the first threaded connection; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded connection. In an exemplary embodiment, at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded connections.

[0324] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member, providing a second tubular member, threadably coupling the first and second tubular members at a first location, threadably coupling the first and second tubular members at a second location spaced apart from the first location, providing a plurality of sleeves, and mounting the sleeves at spaced apart locations for overlapping and coupling the first and second tubular members. In an exemplary embodiment, at least one of the tubular sleeves is positioned in opposing relation to the first threaded coupling; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded coupling. In an exemplary embodiment, at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded couplings.

[0325] An expandable tubular assembly has been described that includes a first tubular member, a second tubular member coupled to the first tubular member, and a plurality of spaced apart tubular sleeves coupled to and receiving end portions of the first and second tubular members.

[0326] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member, providing a second tubular member, providing a plurality of sleeves, coupling the first and second tubular members, and mounting the sleeves at spaced apart locations for overlapping and coupling the first and second tubular members.

[0327] An expandable tubular assembly has been described that includes a first tubular member, a second tubular member coupled to the first tubular member, a threaded connection for coupling a portion of the first and second tubular members, and a tubular sleeves coupled to and receiving end portions of the first and second tubular members, wherein at least a portion of the threaded connection is upset. In an exemplary embodiment, at least a portion of tubular sleeve penetrates the first tubular member.

[0328] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member, providing a second tubular member, threadably coupling the first and second tubular members, and upsetting the threaded coupling. In an exemplary embodiment, the first tubular member further comprises an annular extension extending therefrom, and the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member. In an exemplary embodiment, the first tubular member further comprises an annular extension extending therefrom; and the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member.

[0329] A radially expandable multiple tubular member apparatus has been described that includes a first tubular member, a second tubular member engaged with the first tubular member forming a joint, a sleeve overlapping and coupling the first and second tubular members at the joint, and one or more stress concentrators for concentrating stresses in the joint. In an exemplary

embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member; and one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve.

[0330] A method of joining radially expandable multiple tubular members has been described that includes providing a first tubular member, engaging a second tubular member with the first tubular member to form a joint, providing a sleeve having opposite tapered ends and a flange, one of the tapered ends being a surface formed on the flange, and concentrating stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the second tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member and the second tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member and the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the second tubular member and the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member, the second tubular member, and the sleeve to concentrate stresses within the joint.

[0331] A system for radially expanding and plastically deforming a first tubular member coupled to a second tubular member by a mechanical connection has been described that includes means for radially expanding the first and second tubular members, and means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members.

[0332] A system for radially expanding and plastically deforming a first tubular member coupled to a second tubular member by a mechanical connection has been described that includes means for radially expanding the first and second tubular members; and means for concentrating stresses within

the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members.

[0333] A system for radially expanding and plastically deforming a first tubular member coupled to a second tubular member by a mechanical connection has been described that includes means for radially expanding the first and second tubular members; means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members; and means for concentrating stresses within the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members.

[0334] A radially expandable tubular member apparatus has been described that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; and a sleeve overlapping and coupling the first and second tubular members at the joint; wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus. In an exemplary embodiment, the carbon content of the predetermined portion of the apparatus is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the apparatus is less than 0.21. In an exemplary embodiment, the carbon content of the predetermined portion of the apparatus is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the apparatus is less than 0.36. In an exemplary embodiment, the apparatus further includes means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for concentrating stresses within the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members; and means for concentrating stresses within the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes one or more stress concentrators for concentrating stresses in the joint. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more internal grooves defined in the second

tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve. In an exemplary embodiment, the first tubular member further comprises an annular extension extending therefrom; and wherein the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member. In an exemplary embodiment, the apparatus further includes a threaded connection for coupling a portion of the first and second tubular members; wherein at least a portion of the threaded connection is upset. In an exemplary embodiment, at least a portion of tubular sleeve penetrates the first tubular member. In an exemplary embodiment, the apparatus further includes means for increasing the axial compression loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for increasing the axial tension loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for increasing the axial compression and tension loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for avoiding stress risers in the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the apparatus further includes means for inducing stresses at selected portions of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the means for increasing the axial compression loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the means for increasing the axial tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the means for increasing the axial compression and tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the means for avoiding stress risers in the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular

members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the means for inducing stresses at selected portions of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, at least a portion of the sleeve is comprised of a frangible material. In an exemplary embodiment, the wall thickness of the sleeve is variable. In an exemplary embodiment, the predetermined portion of the apparatus has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly. In an exemplary embodiment, the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed. In an exemplary embodiment, the apparatus further includes positioning another apparatus within the preexisting structure in overlapping relation to the apparatus; and radially expanding and plastically deforming the other apparatus within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the apparatus, a predetermined portion of the other apparatus has a lower yield point than another portion of the other apparatus. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the apparatus is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises an end portion of the apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises a plurality of predetermined portions of the apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises a plurality of spaced apart predetermined portions of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises an end portion of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises a plurality of other portions of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises a plurality of spaced apart other portions of the apparatus. In an exemplary embodiment, the apparatus comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the apparatus; and wherein the tubular members comprise the other portion of the apparatus. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the apparatus. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the apparatus. In an exemplary embodiment, the predetermined portion of

the apparatus defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12. In an exemplary embodiment, the predetermined portion of the apparatus comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the apparatus comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the apparatus comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the apparatus comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the

radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the apparatus is greater than the expandability coefficient of the other portion of the apparatus. In an exemplary embodiment, the apparatus comprises a wellbore casing. In an exemplary embodiment, the apparatus comprises a pipeline. In an exemplary embodiment, the apparatus comprises a structural support.

[0335] A radially expandable tubular member apparatus has been described that includes a first tubular member; a second tubular member engaged with the first tubular member forming a joint; a sleeve overlapping and coupling the first and second tubular members at the joint; the sleeve having opposite tapered ends and a flange engaged in a recess formed in an adjacent tubular member; and one of the tapered ends being a surface formed on the flange; wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus. In an exemplary embodiment, the recess includes a tapered wall in mating engagement with the tapered end formed on the flange. In an exemplary embodiment, the sleeve includes a flange at each tapered end and each tapered end is formed on a respective flange. In an exemplary embodiment, each tubular member includes a recess. In an exemplary embodiment, each flange is engaged in a respective one of the recesses. In an exemplary embodiment, each recess includes a tapered wall in mating engagement with the tapered end formed on a respective one of the flanges. In an exemplary embodiment, the predetermined portion of the apparatus has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a higher ductility prior to the radial expansion and

plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the apparatus has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly. In an exemplary embodiment, the apparatus further includes positioning another apparatus within the preexisting structure in overlapping relation to the apparatus; and radially expanding and plastically deforming the other apparatus within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the apparatus, a predetermined portion of the other apparatus has a lower yield point than another portion of the other apparatus. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the apparatus is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises an end portion of the apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises a plurality of predetermined portions of the apparatus. In an exemplary embodiment, the predetermined portion of the apparatus comprises a plurality of spaced apart predetermined portions of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises an end portion of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises a plurality of other portions of the apparatus. In an exemplary embodiment, the other portion of the apparatus comprises a plurality of spaced apart other portions of the apparatus. In an exemplary embodiment, the apparatus comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the apparatus; and wherein the tubular members comprise the other portion of the apparatus. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the apparatus. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the apparatus. In an exemplary embodiment, the predetermined portion of the apparatus defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the apparatus is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12. In an exemplary embodiment, the predetermined portion of the apparatus comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the

radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the apparatus comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the apparatus comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the apparatus comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic

deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the apparatus is greater than the expandability coefficient of the other portion of the apparatus. In an exemplary embodiment, the apparatus comprises a wellbore casing. In an exemplary embodiment, the apparatus comprises a pipeline. In an exemplary embodiment, the apparatus comprises a structural support.

[0336] A method of joining radially expandable tubular members has been provided that includes: providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve; mounting the sleeve for overlapping and coupling the first and second tubular members at the joint; wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21. In an exemplary embodiment, the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36. In an exemplary embodiment, the method further includes: maintaining portions of the first and second tubular member in circumferential compression following a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the method further includes: concentrating stresses within the joint during a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the method further includes: maintaining portions of the first and second tubular member in circumferential compression following a radial expansion and plastic deformation of the first and second tubular members; and concentrating stresses within the joint during a radial expansion and plastic deformation of the first and second tubular members. In an exemplary embodiment, the method further includes: concentrating stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the second tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member and the second tubular member to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular

member and the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the second tubular member and the sleeve to concentrate stresses within the joint. In an exemplary embodiment, concentrating stresses within the joint comprises using the first tubular member, the second tubular member, and the sleeve to concentrate stresses within the joint. In an exemplary embodiment, at least a portion of the sleeve is comprised of a frangible material. In an exemplary embodiment, the sleeve comprises a variable wall thickness. In an exemplary embodiment, the method further includes maintaining the sleeve in circumferential tension; and maintaining the first and second tubular members in circumferential compression. In an exemplary embodiment, the method further includes maintaining the sleeve in circumferential tension; and maintaining the first and second tubular members in circumferential compression. In an exemplary embodiment, the method further includes: maintaining the sleeve in circumferential tension; and maintaining the first and second tubular members in circumferential compression. In an exemplary embodiment, the method further includes: threadably coupling the first and second tubular members at a first location; threadably coupling the first and second tubular members at a second location spaced apart from the first location; providing a plurality of sleeves; and mounting the sleeves at spaced apart locations for overlapping and coupling the first and second tubular members. In an exemplary embodiment, at least one of the tubular sleeves is positioned in opposing relation to the first threaded coupling; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded coupling. In an exemplary embodiment, at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded couplings. In an exemplary embodiment, the method further includes: threadably coupling the first and second tubular members; and upsetting the threaded coupling. In an exemplary embodiment, the first tubular member further comprises an annular extension extending therefrom; and wherein the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly. In an exemplary embodiment, the method further includes: positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and radially expanding and plastically deforming the other tubular assembly within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the

radially expanded and plastically deformed other portion of the other tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly. In an exemplary embodiment, the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an

exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly. In

an exemplary embodiment, the tubular assembly comprises a wellbore casing. In an exemplary embodiment, the tubular assembly comprises a pipeline. In an exemplary embodiment, the tubular assembly comprises a structural support.

[0337] A method of joining radially expandable tubular members has been described that includes: providing a first tubular member; engaging a second tubular member with the first tubular member to form a joint; providing a sleeve having opposite tapered ends and a flange, one of the tapered ends being a surface formed on the flange; mounting the sleeve for overlapping and coupling the first and second tubular members at the joint, wherein the flange is engaged in a recess formed in an adjacent one of the tubular members; wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly. In an exemplary embodiment, the method further includes: providing a tapered wall in the recess for mating engagement with the tapered end formed on the flange. In an exemplary embodiment, the method further includes: providing a flange at each tapered end wherein each tapered end is formed on a respective flange. In an exemplary embodiment, the method further includes: providing a recess in each tubular member. In an exemplary embodiment, the method further includes: engaging each flange in a respective one of the recesses. In an exemplary embodiment, the method further includes: providing a tapered wall in each recess for mating engagement with the tapered end formed on a respective one of the flanges. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly. In an exemplary embodiment, the method further includes: positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and radially expanding and plastically deforming the other tubular assembly within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of spaced apart

predetermined portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly. In an exemplary embodiment, the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the

predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly. In an exemplary embodiment, the tubular assembly comprises a wellbore casing. In an exemplary embodiment, the tubular assembly comprises a pipeline. In an exemplary embodiment, the tubular assembly comprises a structural support.

[0338] An expandable tubular assembly has been described that includes a first tubular member; a second tubular member coupled to the first tubular member; a first threaded connection for coupling

a portion of the first and second tubular members; a second threaded connection spaced apart from the first threaded connection for coupling another portion of the first and second tubular members; a tubular sleeve coupled to and receiving end portions of the first and second tubular members; and a sealing element positioned between the first and second spaced apart threaded connections for sealing an interface between the first and second tubular member; wherein the sealing element is positioned within an annulus defined between the first and second tubular members; and wherein, prior to a radial expansion and plastic deformation of the assembly, a predetermined portion of the assembly has a lower yield point than another portion of the apparatus. In an exemplary embodiment, the predetermined portion of the assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the assembly has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly. In an exemplary embodiment, the assembly further includes: positioning another assembly within the preexisting structure in overlapping relation to the assembly; and radially expanding and plastically deforming the other assembly within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the assembly, a predetermined portion of the other assembly has a lower yield point than another portion of the other assembly. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other assembly. In an exemplary embodiment, the predetermined portion of the assembly comprises an end portion of the assembly. In an exemplary embodiment, the predetermined portion of the assembly comprises a plurality of predetermined portions of the assembly. In an exemplary embodiment, the predetermined portion of the assembly comprises a plurality of spaced apart predetermined portions of the assembly. In an exemplary embodiment, the other portion of the assembly comprises an end portion of the assembly. In an exemplary embodiment, the other portion of the assembly comprises a plurality of other portions of the assembly. In an exemplary embodiment, the other portion of the assembly comprises a plurality of spaced apart other portions of the assembly. In an exemplary embodiment, the assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the assembly; and wherein the tubular members comprise the other portion of the assembly. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the assembly. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the assembly. In an exemplary embodiment, the predetermined portion of the assembly defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the assembly is greater than 1. In an

exemplary embodiment, the anisotropy for the predetermined portion of the assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the assembly is greater than 0.12. In an exemplary embodiment, the predetermined portion of the assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.48. In an

exemplary embodiment, the yield point of the predetermined portion of the assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the assembly is greater than the expandability coefficient of the other portion of the assembly. In an exemplary embodiment, the assembly comprises a wellbore casing. In an exemplary embodiment, the assembly comprises a pipeline. In an exemplary embodiment, the assembly comprises a structural support. In an exemplary embodiment, the annulus is at least partially defined by an irregular surface. In an exemplary embodiment, the annulus is at least partially defined by a toothed surface. In an exemplary embodiment, the sealing element comprises an elastomeric material. In an exemplary embodiment, the sealing element comprises a metallic material. In an exemplary embodiment, the sealing element comprises an elastomeric and a metallic material.

[0339] A method of joining radially expandable tubular members is provided that includes providing a first tubular member; providing a second tubular member; providing a sleeve; mounting the sleeve for overlapping and coupling the first and second tubular members; threadably coupling the first and second tubular members at a first location; threadably coupling the first and second tubular members at a second location spaced apart from the first location; sealing an interface between the first and second tubular members between the first and second locations using a compressible sealing element, wherein the first tubular member, second tubular member, sleeve, and the sealing element define a tubular assembly; and radially expanding and plastically deforming the tubular assembly; wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly. In an exemplary embodiment, the sealing element includes an irregular surface. In an exemplary embodiment, the sealing element includes a toothed surface. In an exemplary embodiment, the sealing element comprises an elastomeric material. In an exemplary embodiment, the sealing element comprises a metallic material. In an exemplary embodiment, the sealing element comprises

an elastomeric and a metallic material. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation. In an exemplary embodiment, the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly. In an exemplary embodiment, the method further includes: positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and radially expanding and plastically deforming the other tubular assembly within the preexisting structure; wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly. In an exemplary embodiment, the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises an end portion of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly. In an exemplary embodiment, the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly. In an exemplary embodiment, the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings. In an exemplary embodiment, the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly. In an exemplary embodiment, one or more of the tubular couplings comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, one or more of the tubular members comprise the predetermined portions of the tubular assembly. In an exemplary embodiment, the predetermined portion of the tubular assembly defines one or more openings. In an exemplary embodiment, one or more of the openings comprise slots. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1. In an exemplary embodiment, the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary embodiment, the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12. In an exemplary

embodiment, the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92. In an exemplary embodiment, the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation. In an exemplary embodiment,

the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34. In an exemplary embodiment, the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92. In an exemplary embodiment, the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12. In an exemplary embodiment, the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly. In an exemplary embodiment, the tubular assembly comprises a wellbore casing. In an exemplary embodiment, the tubular assembly comprises a pipeline. In an exemplary embodiment, the tubular assembly comprises a structural support. In an exemplary embodiment, the sleeve comprises: a plurality of spaced apart tubular sleeves coupled to and receiving end portions of the first and second tubular members. In an exemplary embodiment, the first tubular member comprises a first threaded connection; wherein the second tubular member comprises a second threaded connection; wherein the first and second threaded connections are coupled to one another; wherein at least one of the tubular sleeves is positioned in opposing relation to the first threaded connection; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded connection. In an exemplary embodiment, the first tubular member comprises a first threaded connection; wherein the second tubular member comprises a second threaded connection; wherein the first and second threaded connections are coupled to one another; and wherein at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded connections. In an exemplary embodiment, the carbon content of the tubular member is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.21. In an exemplary embodiment, the tubular member comprises a wellbore casing.

[0340] An expandable tubular member has been described, wherein the carbon content of the tubular member is greater than 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.36. In an exemplary embodiment, the tubular member comprises a wellbore casing.

[0341] A method of selecting tubular members for radial expansion and plastic deformation has been described that includes: selecting a tubular member from a collection of tubular member; determining a carbon content of the selected tubular member; determining a carbon equivalent value for the selected tubular member; and if the carbon content of the selected tubular member is less than

or equal to 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.21, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

[0342] A method of selecting tubular members for radial expansion and plastic deformation has been described that includes: selecting a tubular member from a collection of tubular member; determining a carbon content of the selected tubular member; determining a carbon equivalent value for the selected tubular member; and if the carbon content of the selected tubular member is greater than 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.36, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

[0343] An expandable tubular member has been described that includes: a tubular body; wherein a yield point of an inner tubular portion of the tubular body is less than a yield point of an outer tubular portion of the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body. In an exemplary embodiment, the rate of change of the yield point of

the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body. In an exemplary embodiment, the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

[0344] A method of manufacturing an expandable tubular member has been described that includes: providing a tubular member; heat treating the tubular member; and quenching the tubular member; wherein following the quenching, the tubular member comprises a microstructure comprising a hard phase structure and a soft phase structure. In an exemplary embodiment, the provided tubular member comprises, by weight percentage, 0.065% C, 1.44% Mn, 0.01% P, 0.002% S, 0.24% Si, 0.01% Cu, 0.01% Ni, 0.02% Cr, 0.05% V, 0.01% Mo, 0.01% Nb, and 0.01%Ti. In an exemplary embodiment, the provided tubular member comprises, by weight percentage, 0.18% C, 1.28% Mn, 0.017% P, 0.004% S, 0.29% Si, 0.01% Cu, 0.01% Ni, 0.03% Cr, 0.04% V, 0.01% Mo, 0.03% Nb, and 0.01%Ti. In an exemplary embodiment, the provided tubular member comprises, by weight percentage, 0.08% C, 0.82% Mn, 0.006% P, 0.003% S, 0.30% Si, 0.06% Cu, 0.05% Ni, 0.05% Cr, 0.03% V, 0.03% Mo, 0.01% Nb, and 0.01%Ti. In an exemplary embodiment, the provided tubular member comprises a microstructure comprising one or more of the following: martensite, pearlite, vanadium carbide, nickel carbide, or titanium carbide. In an exemplary embodiment, the provided tubular member comprises a microstructure comprising one or more of the following: pearlite or pearlite striation.. In an exemplary embodiment, the provided tubular member comprises a microstructure comprising one or more of the following: grain pearlite, widmanstatten martensite, vanadium carbide, nickel carbide, or titanium carbide. In an exemplary embodiment, the heat treating comprises heating the provided tubular member for about 10 minutes at 790 °C. In an exemplary embodiment, the quenching comprises quenching the heat treated tubular member in water. In an exemplary embodiment, following the quenching, the tubular member comprises a microstructure comprising one or more of the following: ferrite, grain pearlite, or martensite. In an exemplary embodiment, following the quenching, the tubular member comprises a microstructure comprising one or more of the following: ferrite, martensite, or bainite. In an exemplary embodiment, following the quenching, the tubular member comprises a microstructure comprising one or more of the following: bainite, pearlite, or ferrite. In an exemplary embodiment, following the quenching, the tubular member comprises a yield strength of about 67ksi and a tensile strength of about 95 ksi. In an exemplary embodiment, following the quenching, the tubular member comprises a yield strength of about 82 ksi and a tensile strength of about 130 ksi. In an exemplary embodiment, following the quenching, the tubular member comprises a yield strength of about 60 ksi and a tensile strength of about 97 ksi. In an exemplary embodiment, the method further includes: positioning the quenched tubular member within a preexisting structure; and radially expanding and plastically deforming the tubular member within the preexisting structure.

[0345] A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member has been described that includes forming the expandable member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0346] An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member has been described that includes a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0347] A structural completion positioned within a structure has been described that includes one or more radially expanded and plastically deformed expandable members positioned within the structure; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

[0348] A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member has been described that includes forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0349] An expandable member for use in completing a wellbore by radially expanding and plastically deforming the expandable member at a downhole location in the wellbore has been described that includes a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0350] A structural completion has been described that includes one or more radially expanded and plastically deformed expandable members positioned within the wellbore; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

[0351] A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member has been described that includes forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0352] An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member has been described that includes a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0353] A structural completion has been described that includes one or more radially expanded and plastically deformed expandable members; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

[0354] A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member has been described that includes forming the expandable member from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0355] An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member has been described that includes a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0356] A structural completion has been described that includes one or more radially expanded and plastically deformed expandable members; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5.

[0357] A method for manufacturing an expandable tubular member used to complete a structure by radially expanding and plastically deforming the expandable member has been described that includes forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0358] An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member has been described that includes an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0359] A structural completion has been described that includes one or more radially expanded and plastically deformed expandable members positioned within the structure; wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

[0360] A method of constructing a structure has been described that includes radially expanding and plastically deforming an expandable member; wherein an outer portion of the wall thickness of the radially expanded and plastically deformed expandable member comprises tensile residual stresses.

[0361] A structural completion has been described that includes one or more radially expanded and plastically deformed expandable members; wherein an outer portion of the wall thickness of one or more of the radially expanded and plastically deformed expandable members comprises tensile residual stresses.

[0362] A method of constructing a structure using an expandable tubular member has been described that includes strain aging the expandable member; and then radially expanding and plastically deforming the expandable member.

[0363] A method for manufacturing a tubular member used to complete a wellbore by radially expanding the tubular member at a downhole location in the wellbore has been described that

includes forming a steel alloy comprising a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy. In an exemplary embodiment, the method further includes forming the steel alloy with a concentration of niobium comprising between approximately 0.015% and 0.12% by weight of the steel alloy. In an exemplary embodiment, the method further includes forming the steel alloy with low concentrations of niobium and titanium; and limiting the total concentration of niobium and titanium to less than approximately 0.6% by weight of the steel alloy.

[0364] An expandable tubular member has been described that is fabricated from a steel alloy having a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy.

[0365] A method for manufacturing an expandable tubular member used to complete a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore has been described that includes forming the expandable tubular member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs; forming the expandable member from a steel alloy comprising a charpy V-notch impact toughness of at least about 6 joules; forming the expandable member from a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and strain aging the expandable tubular member prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

[0366] An expandable tubular member for use in completing a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore has been described that includes a steel alloy having a charpy energy of at least about 90 ft-lbs; a steel alloy having a charpy V-notch impact toughness of at least about 6 joules; and a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; wherein a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and wherein the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

[0367] A wellbore completion positioned within a wellbore that traverses a subterranean formation has been described that includes one or more radially expanded and plastically deformed expandable tubular members positioned within the wellbore completion; wherein one or more of the radially expanded and plastically deformed expandable tubular members are fabricated from: a steel alloy comprising a charpy energy of at least about 90 ft-lbs; a steel alloy comprising a charpy V-notch

impact toughness of at least about 6 joules; and a steel alloy comprising the following ranges of weight percentages: C, from about 0.002 to about 0.08; Si, from about 0.009 to about 0.30; Mn, from about 0.10 to about 1.92; P, from about 0.004 to about 0.07; S, from about 0.0008 to about 0.006; Al, up to about 0.04; N, up to about 0.01; Cu, up to about 0.3; Cr, up to about 0.5; Ni, up to about 18; Nb, up to about 0.12; Ti, up to about 0.6; Co, up to about 9; and Mo, up to about 5; wherein at least one of the expandable members comprises a ratio of the of an outside diameter of the expandable member to a wall thickness of the expandable member ranging from about 12 to 22; wherein an outer portion of the wall thickness of at least one of the radially expanded and plastically deformed expandable comprises tensile residual stresses; and wherein at least one of the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

[0368] It is understood that variations may be made in the foregoing without departing from the scope of the invention. For example, the teachings of the present illustrative embodiments may be used to provide a wellbore casing, a pipeline, or a structural support. Furthermore, the elements and teachings of the various illustrative embodiments may be combined in whole or in part in some or all of the illustrative embodiments. In addition, one or more of the elements and teachings of the various illustrative embodiments may be omitted, at least in part, and/or combined, at least in part, with one or more of the other elements and teachings of the various illustrative embodiments.

[0369] Although illustrative embodiments of the invention have been shown and described, a wide range of modification, changes and substitution is contemplated in the foregoing disclosure. In some instances, some features of the present invention may be employed without a corresponding use of the other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.

What is claimed is:

1. A method of forming a tubular liner within a preexisting structure, comprising:

positioning a tubular assembly within the preexisting structure; and

radially expanding and plastically deforming the tubular assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

2. The method of claim 1, wherein the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

3. The method of claim 1, wherein the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

4. The method of claim 1, wherein the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

5. The method of claim 1, wherein the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly.

6. The method of claim 5, further comprising:

positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and

radially expanding and plastically deforming the other tubular assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly.

7. The method of claim 6, wherein the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly.

8. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises

an end portion of the tubular assembly.

9. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly.

10. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly.

11. The method of claim 1, wherein the other portion of the tubular assembly comprises an end portion of the tubular assembly.

12. The method of claim 1, wherein the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly.

13. The method of claim 1, wherein the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly.

14. The method of claim 1, wherein the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

15. The method of claim 14, wherein the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly.

16. The method of claim 14, wherein one or more of the tubular couplings comprise the predetermined portions of the tubular assembly.

17. The method of claim 14, wherein one or more of the tubular members comprise the predetermined portions of the tubular assembly.

18. The method of claim 1, wherein the predetermined portion of the tubular assembly defines one or more openings.

19. The method of claim 18, wherein one or more of the openings comprise slots.

20. The method of claim 18, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

21. The method of claim 1, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

22. The method of claim 1, wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

23. The method of claim 1, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

24. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

25. The method of claim 24, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

26. The method of claim 24, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

27. The method of claim 24, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48.

28. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

29. The method of claim 28, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

30. The method of claim 28, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

31. The method of claim 28, wherein the anisotropy of the predetermined portion of the tubular

assembly, prior to the radial expansion and plastic deformation, is about 1.04.

32. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

33. The method of claim 32, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92.

34. The method of claim 1, wherein the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

35. The method of claim 34, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34.

36. The method of claim 1, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

37. The method of claim 1, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

38. The method of claim 1, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48.

39. The method of claim 1, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

40. The method of claim 1, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

41. The method of claim 1, wherein the anisotropy of the predetermined portion of the tubular

assembly, prior to the radial expansion and plastic deformation, is at least about 1.04.

42. The method of claim 1, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92.

43. The method of claim 1, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34.

44. The method of claim 1, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

45. The method of claim 1, wherein the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

46. The method of claim 1, wherein the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12.

47. The method of claim 1, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly.

48. The method of claim 1, wherein the tubular assembly comprises a wellbore casing.

49. The method of claim 1, wherein the tubular assembly comprises a pipeline.

50. The method of claim 1, wherein the tubular assembly comprises a structural support.

51. An expandable tubular member comprising a steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

52. The tubular member of claim 51, wherein a yield point of the tubular member is at most about 46.9 ksi prior to a radial expansion and plastic deformation; and wherein a yield point of the tubular member is at least about 65.9 ksi after the radial expansion and plastic deformation.

53. The tubular member of claim 51, wherein the yield point of the tubular member after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the tubular member prior to the radial expansion and plastic deformation.

54. The tubular member of claim 51, wherein the anisotropy of the tubular member, prior to a

radial expansion and plastic deformation, is about 1.48.

55. The tubular member of claim 51, wherein the tubular member comprises a wellbore casing.

56. The tubular member of claim 51, wherein the tubular member comprises a pipeline.

57. The tubular member of claim 51, wherein the tubular member comprises a structural support.

58. An expandable tubular member comprising a steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

59. The tubular member of claim 58, wherein a yield point of the tubular member is at most about 57.8 ksi prior to a radial expansion and plastic deformation; and wherein the yield point of the tubular member is at least about 74.4 ksi after the radial expansion and plastic deformation.

60. The tubular member of claim 58, wherein a yield point of the of the tubular member after a radial expansion and plastic deformation is at least about 28 % greater than the yield point of the tubular member prior to the radial expansion and plastic deformation.

61. The tubular member of claim 58, wherein the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.04.

62. The tubular member of claim 58, wherein the tubular member comprises a wellbore casing.

63. The tubular member of claim 58, wherein the tubular member comprises a pipeline.

64. The tubular member of claim 58, wherein the tubular member comprises a structural support.

65. An expandable tubular member comprising a steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

66. The tubular member of claim 65, wherein the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.92.

67. The tubular member of claim 65, wherein the tubular member comprises a wellbore casing.

68. The tubular member of claim 65, wherein the tubular member comprises a pipeline.

69. The tubular member of claim 65, wherein the tubular member comprises a structural support.

70. An expandable tubular member comprising a steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

71. The tubular member of claim 70, wherein the anisotropy of the tubular member, prior to a radial expansion and plastic deformation, is about 1.34.

72. The tubular member of claim 70, wherein the tubular member comprises a wellbore casing.

73. The tubular member of claim 70, wherein the tubular member comprises a pipeline.

74. The tubular member of claim 70, wherein the tubular member comprises a structural support.

75. An expandable tubular member, wherein the yield point of the expandable tubular member is at most about 46.9 ksi prior to a radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 65.9 ksi after the radial expansion and plastic deformation.

76. The tubular member of claim 75, wherein the tubular member comprises a wellbore casing.

77. The tubular member of claim 75, wherein the tubular member comprises a pipeline.

78. The tubular member of claim 75, wherein the tubular member comprises a structural support.

79. An expandable tubular member, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 40 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

80. The tubular member of claim 79, wherein the tubular member comprises a wellbore casing.

81. The tubular member of claim 79, wherein the tubular member comprises a pipeline.

82. The tubular member of claim 79, wherein the tubular member comprises a structural support.

83. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.48.

84. The tubular member of claim 83, wherein the tubular member comprises a wellbore casing.

85. The tubular member of claim 83, wherein the tubular member comprises a pipeline.

86. The tubular member of claim 83, wherein the tubular member comprises a structural support.

87. An expandable tubular member, wherein the yield point of the expandable tubular member is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the expandable tubular member is at least about 74.4 ksi after the radial expansion and plastic deformation.

88. The tubular member of claim 87, wherein the tubular member comprises a wellbore casing.

89. The tubular member of claim 87, wherein the tubular member comprises a pipeline.

90. The tubular member of claim 87, wherein the tubular member comprises a structural support.

91. An expandable tubular member, wherein the yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 28 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

92. The tubular member of claim 91, wherein the tubular member comprises a wellbore casing.

93. The tubular member of claim 91, wherein the tubular member comprises a pipeline.

94. The tubular member of claim 91, wherein the tubular member comprises a structural support.

95. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.04.

96. The tubular member of claim 95, wherein the tubular member comprises a wellbore casing.

97. The tubular member of claim 95, wherein the tubular member comprises a pipeline.

98. The tubular member of claim 95, wherein the tubular member comprises a structural support.

99. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.92.

100. The tubular member of claim 99, wherein the tubular member comprises a wellbore casing.

101. The tubular member of claim 99, wherein the tubular member comprises a pipeline.

102. The tubular member of claim 99, wherein the tubular member comprises a structural support.

103. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, is at least about 1.34.

104. The tubular member of claim 103, wherein the tubular member comprises a wellbore casing.

105. The tubular member of claim 103, wherein the tubular member comprises a pipeline.

106. The tubular member of claim 103, wherein the tubular member comprises a structural support.

107. An expandable tubular member, wherein the anisotropy of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

108. The tubular member of claim 107, wherein the tubular member comprises a wellbore casing.

109. The tubular member of claim 107, wherein the tubular member comprises a pipeline.

110. The tubular member of claim 107, wherein the tubular member comprises a structural support.

111. An expandable tubular member; wherein the yield point of the expandable tubular member, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

112. The tubular member of claim 111, wherein the tubular member comprises a wellbore casing.

113. The tubular member of claim 111, wherein the tubular member comprises a pipeline.

114. The tubular member of claim 111, wherein the tubular member comprises a structural support.

115. An expandable tubular member, wherein the expandability coefficient of the expandable tubular member, prior to the radial expansion and plastic deformation, is greater than 0.12.

116. The tubular member of claim 115, wherein the tubular member comprises a wellbore casing.

117. The tubular member of claim 115, wherein the tubular member comprises a pipeline.

118. The tubular member of claim 115, wherein the tubular member comprises a structural support.

119. An expandable tubular member, wherein the expandability coefficient of the expandable tubular member is greater than the expandability coefficient of another portion of the expandable tubular member.

120. The tubular member of claim 119, wherein the tubular member comprises a wellbore casing.

121. The tubular member of claim 119, wherein the tubular member comprises a pipeline.

122. The tubular member of claim 119, wherein the tubular member comprises a structural support.

123. An expandable tubular member, wherein the tubular member has a higher ductility and a lower yield point prior to a radial expansion and plastic deformation than after the radial expansion and plastic deformation.

124. The tubular member of claim 123, wherein the tubular member comprises a wellbore casing.

125. The tubular member of claim 123, wherein the tubular member comprises a pipeline.

126. The tubular member of claim 123, wherein the tubular member comprises a structural support.

127. A method of radially expanding and plastically deforming a tubular assembly comprising a first tubular member coupled to a second tubular member, comprising:

radially expanding and plastically deforming the tubular assembly within a preexisting structure; and

using less power to radially expand each unit length of the first tubular member than to radially expand each unit length of the second tubular member.

128. The method of claim 127, wherein the tubular member comprises a wellbore casing.

129. The method of claim 127, wherein the tubular member comprises a pipeline.

130. The method of claim 127, wherein the tubular member comprises a structural support.

131. A system for radially expanding and plastically deforming a tubular assembly comprising a first tubular member coupled to a second tubular member, comprising:

means for radially expanding the tubular assembly within a preexisting structure; and

means for using less power to radially expand each unit length of the first tubular member

than to radially expand each unit length of the second tubular member.

132. The system of claim 131, wherein the tubular member comprises a wellbore casing.

133. The system of claim 131, wherein the tubular member comprises a pipeline.

134. The system of claim 131, wherein the tubular member comprises a structural support.

135. A method of manufacturing a tubular member, comprising:
processing a tubular member until the tubular member is characterized by one or more intermediate characteristics;
positioning the tubular member within a preexisting structure; and
processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics.

136. The method of claim 135, wherein the tubular member comprises a wellbore casing.

137. The method of claim 135, wherein the tubular member comprises a pipeline.

138. The method of claim 135, wherein the tubular member comprises a structural support.

139. The method of claim 135, wherein the preexisting structure comprises a wellbore that traverses a subterranean formation.

140. The method of claim 135, wherein the characteristics are selected from a group consisting of yield point and ductility.

141. The method of claim 135, wherein processing the tubular member within the preexisting structure until the tubular member is characterized one or more final characteristics comprises:
radially expanding and plastically deforming the tubular member within the preexisting structure.

142. An apparatus, comprising:
an expandable tubular assembly; and
an expansion device coupled to the expandable tubular assembly;
wherein a predetermined portion of the expandable tubular assembly has a lower yield point than another portion of the expandable tubular assembly.

143. The apparatus of claim 142, wherein the expansion device comprises a rotary expansion device.

144. The apparatus of claim 142, wherein the expansion device comprises an axially displaceable expansion device.

145. The apparatus of claim 142, wherein the expansion device comprises a reciprocating expansion device.

146. The apparatus of claim 142, wherein the expansion device comprises a hydroforming expansion device.

147. The apparatus of claim 142, wherein the expansion device comprises an impulsive force expansion device.

148. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly has a higher ductility and a lower yield point than another portion of the expandable tubular assembly.

149. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly has a higher ductility than another portion of the expandable tubular assembly.

150. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly has a lower yield point than another portion of the expandable tubular assembly.

151. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly.

152. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly.

153. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly.

154. The apparatus of claim 142, wherein the other portion of the tubular assembly comprises an end portion of the tubular assembly.

155. The apparatus of claim 142, wherein the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly.

156. The apparatus of claim 142, wherein the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly.

157. The apparatus of claim 142, wherein the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

158. The apparatus of claim 157, wherein the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly.

159. The apparatus of claim 157, wherein one or more of the tubular couplings comprise the predetermined portions of the tubular assembly.

160. The apparatus of claim 157, wherein one or more of the tubular members comprise the predetermined portions of the tubular assembly.

161. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly defines one or more openings.

162. The apparatus of claim 161, wherein one or more of the openings comprise slots.

163. The apparatus of claim 161, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

164. The apparatus of claim 142, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

165. The apparatus of claim 142, wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

166. The apparatus of claim 142, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

167. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

168. The apparatus of claim 167, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi.

169. The apparatus of claim 167, wherein the anisotropy of the predetermined portion of the tubular assembly is about 1.48.

170. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

171. The apparatus of claim 170, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi.

172. The apparatus of claim 170, wherein the anisotropy of the predetermined portion of the tubular assembly is about 1.04.

173. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

174. The apparatus of claim 173, wherein the anisotropy of the predetermined portion of the tubular assembly is about 1.92.

175. The apparatus of claim 142, wherein the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

176. The apparatus of claim 175, wherein the anisotropy of the predetermined portion of the tubular assembly is at least about 1.34.

177. The apparatus of claim 142, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi.

178. The apparatus of claim 142, wherein the anisotropy of the predetermined portion of the tubular assembly is at least about 1.48.

179. The apparatus of claim 142, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi.

180. The apparatus of claim 142, wherein the anisotropy of the predetermined portion of the tubular assembly is at least about 1.04.

181. The apparatus of claim 142, wherein the anisotropy of the predetermined portion of the tubular assembly is at least about 1.92.

182. The apparatus of claim 142, wherein the anisotropy of the predetermined portion of the tubular assembly is at least about 1.34.

183. The apparatus of claim 142, wherein the anisotropy of the predetermined portion of the tubular assembly ranges from about 1.04 to about 1.92.

184. The apparatus of claim 142, wherein the yield point of the predetermined portion of the tubular assembly ranges from about 47.6 ksi to about 61.7 ksi.

185. The apparatus of claim 142, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than 0.12.

186. The apparatus of claim 142, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly.

187. The apparatus of claim 142, wherein the tubular assembly comprises a wellbore casing.

188. The apparatus of claim 142, wherein the tubular assembly comprises a pipeline.

189. The apparatus of claim 142, wherein the tubular assembly comprises a structural support.

190. An expandable tubular member, wherein a yield point of the expandable tubular member after a radial expansion and plastic deformation is at least about 5.8 % greater than the yield point of the expandable tubular member prior to the radial expansion and plastic deformation.

191. The tubular member of claim 190, wherein the tubular member comprises a wellbore casing.

192. The tubular member of claim 190, wherein the tubular member comprises a pipeline.

193. The tubular member of claim 190, wherein the tubular member comprises a structural support.

194. A method of determining the expandability of a selected tubular member, comprising:
determining an anisotropy value for the selected tubular member;
determining a strain hardening value for the selected tubular member; and
multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member.

195. The method of claim 194, wherein an anisotropy value greater than 0.12 indicates that the

tubular member is suitable for radial expansion and plastic deformation.

196. The method of claim 194, wherein the tubular member comprises a wellbore casing.

197. The method of claim 194, wherein the tubular member comprises a pipeline.

198. The method of claim 194, wherein the tubular member comprises a structural support.

199. A method of radially expanding and plastically deforming tubular members, comprising:
selecting a tubular member;
determining an anisotropy value for the selected tubular member;
determining a strain hardening value for the selected tubular member;
multiplying the anisotropy value times the strain hardening value to generate an expandability value for the selected tubular member; and
if the anisotropy value is greater than 0.12, then radially expanding and plastically deforming the selected tubular member.

200. The method of claim 199, wherein the tubular member comprises a wellbore casing.

201. The method of claim 199, wherein the tubular member comprises a pipeline.

202. The method of claim 199, wherein the tubular member comprises a structural support.

203. The method of claim 199, wherein radially expanding and plastically deforming the selected tubular member comprises:
inserting the selected tubular member into a preexisting structure; and
then radially expanding and plastically deforming the selected tubular member.

204. The method of claim 203, wherein the preexisting structure comprises a wellbore that traverses a subterranean formation.

205. A radially expandable tubular member apparatus comprising:
a first tubular member;
a second tubular member engaged with the first tubular member forming a joint; and
a sleeve overlapping and coupling the first and second tubular members at the joint;
wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus.

206. The apparatus of claim 205, wherein the predetermined portion of the apparatus has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the

radial expansion and plastic deformation.

207. The apparatus of claim 205, wherein the predetermined portion of the apparatus has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

208. The apparatus of claim 205, wherein the predetermined portion of the apparatus has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

209. The apparatus of claim 205, wherein the predetermined portion of the apparatus has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly.

210. The apparatus of claim 209, further comprising:

positioning another apparatus within the preexisting structure in overlapping relation to the apparatus; and

radially expanding and plastically deforming the other apparatus within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the apparatus, a predetermined portion of the other apparatus has a lower yield point than another portion of the other apparatus.

211. The apparatus of claim 210, wherein the inside diameter of the radially expanded and plastically deformed other portion of the apparatus is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other apparatus.

212. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises an end portion of the apparatus.

213. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a plurality of predetermined portions of the apparatus.

214. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a plurality of spaced apart predetermined portions of the apparatus.

215. The apparatus of claim 205, wherein the other portion of the apparatus comprises an end portion of the apparatus.

216. The apparatus of claim 205, wherein the other portion of the apparatus comprises a plurality

of other portions of the apparatus.

217. The apparatus of claim 205, wherein the other portion of the apparatus comprises a plurality of spaced apart other portions of the apparatus.

218. The apparatus of claim 205, wherein the apparatus comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

219. The apparatus of claim 218, wherein the tubular couplings comprise the predetermined portions of the apparatus; and wherein the tubular members comprise the other portion of the apparatus.

220. The apparatus of claim 218, wherein one or more of the tubular couplings comprise the predetermined portions of the apparatus.

221. The apparatus of claim 218, wherein one or more of the tubular members comprise the predetermined portions of the apparatus.

222. The apparatus of claim 205, wherein the predetermined portion of the apparatus defines one or more openings.

223. The apparatus of claim 222, wherein one or more of the openings comprise slots.

224. The apparatus of claim 222, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1.

225. The apparatus of claim 205, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1.

226. The apparatus of claim 205, wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12.

227. The apparatus of claim 205, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12.

228. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

229. The apparatus of claim 228, wherein the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation.

230. The apparatus of claim 228, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

231. The apparatus of claim 228, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.48.

232. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

233. The apparatus of claim 232, wherein the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation.

234. The apparatus of claim 232, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

235. The apparatus of claim 232, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.04.

236. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

237. The apparatus of claim 236, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.92.

238. The apparatus of claim 205, wherein the predetermined portion of the apparatus comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

239. The apparatus of claim 238, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.34.

240. The apparatus of claim 205, wherein the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation.

241. The apparatus of claim 205, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

242. The apparatus of claim 205, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.48.

243. The apparatus of claim 205, wherein the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation.

244. The apparatus of claim 205, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

245. The apparatus of claim 205, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.04.

246. The apparatus of claim 205, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.92.

247. The apparatus of claim 205, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.34.

248. The apparatus of claim 205, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

249. The apparatus of claim 205, wherein the yield point of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

250. The apparatus of claim 205, wherein the expandability coefficient of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is greater than 0.12.

251. The apparatus of claim 205, wherein the expandability coefficient of the predetermined portion of the apparatus is greater than the expandability coefficient of the other portion of the apparatus.

252. The apparatus of claim 205, wherein the apparatus comprises a wellbore casing.

253. The apparatus of claim 205, wherein the apparatus comprises a pipeline.

254. The apparatus of claim 205, wherein the apparatus comprises a structural support.

255. A radially expandable tubular member apparatus comprising:
a first tubular member;
a second tubular member engaged with the first tubular member forming a joint;
a sleeve overlapping and coupling the first and second tubular members at the joint;
the sleeve having opposite tapered ends and a flange engaged in a recess formed in an adjacent tubular member; and
one of the tapered ends being a surface formed on the flange;
wherein, prior to a radial expansion and plastic deformation of the apparatus, a predetermined portion of the apparatus has a lower yield point than another portion of the apparatus.

256. The apparatus as defined in claim 255 wherein the recess includes a tapered wall in mating engagement with the tapered end formed on the flange.

257. The apparatus as defined in claim 255 wherein the sleeve includes a flange at each tapered end and each tapered end is formed on a respective flange.

258. The apparatus as defined in claim 257 wherein each tubular member includes a recess.

259. The apparatus as defined in claim 258 wherein each flange is engaged in a respective one of the recesses.

260. The apparatus as defined in claim 259 wherein each recess includes a tapered wall in mating engagement with the tapered end formed on a respective one of the flanges.

261. The apparatus of claim 255, wherein the predetermined portion of the apparatus has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

262. The apparatus of claim 255, wherein the predetermined portion of the apparatus has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

263. The apparatus of claim 255, wherein the predetermined portion of the apparatus has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

264. The apparatus of claim 255, wherein the predetermined portion of the apparatus has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly.

265. The apparatus of claim 264, further comprising:

positioning another apparatus within the preexisting structure in overlapping relation to the apparatus; and

radially expanding and plastically deforming the other apparatus within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the apparatus, a predetermined portion of the other apparatus has a lower yield point than another portion of the other apparatus.

266. The apparatus of claim 265, wherein the inside diameter of the radially expanded and plastically deformed other portion of the apparatus is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other apparatus.

267. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises an end portion of the apparatus.

268. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a plurality of predetermined portions of the apparatus.

269. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a plurality of spaced apart predetermined portions of the apparatus.

270. The apparatus of claim 255, wherein the other portion of the apparatus comprises an end

portion of the apparatus.

271. The apparatus of claim 255, wherein the other portion of the apparatus comprises a plurality of other portions of the apparatus.

272. The apparatus of claim 255, wherein the other portion of the apparatus comprises a plurality of spaced apart other portions of the apparatus.

273. The apparatus of claim 255, wherein the apparatus comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

274. The apparatus of claim 273, wherein the tubular couplings comprise the predetermined portions of the apparatus; and wherein the tubular members comprise the other portion of the apparatus.

275. The apparatus of claim 273, wherein one or more of the tubular couplings comprise the predetermined portions of the apparatus.

276. The apparatus of claim 273, wherein one or more of the tubular members comprise the predetermined portions of the apparatus.

277. The apparatus of claim 255, wherein the predetermined portion of the apparatus defines one or more openings.

278. The apparatus of claim 277, wherein one or more of the openings comprise slots.

279. The apparatus of claim 277, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1.

280. The apparatus of claim 255, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1.

281. The apparatus of claim 255, wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12.

282. The apparatus of claim 255, wherein the anisotropy for the predetermined portion of the apparatus is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the apparatus is greater than 0.12.

283. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a

first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

284. The apparatus of claim 283, wherein the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation.

285. The apparatus of claim 283, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic defomation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

286. The apparatus of claim 283, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.48.

287. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

288. The apparatus of claim 287, wherein the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation.

289. The apparatus of claim 287, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

290. The apparatus of claim 287, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.04.

291. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

292. The apparatus of claim 291, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.92.

293. The apparatus of claim 255, wherein the predetermined portion of the apparatus comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

294. The apparatus of claim 293, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is about 1.34.

295. The apparatus of claim 255, wherein the yield point of the predetermined portion of the apparatus is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 65.9 ksi after the radial expansion and plastic deformation.

296. The apparatus of claim 255, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

297. The apparatus of claim 255, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.48.

298. The apparatus of claim 255, wherein the yield point of the predetermined portion of the apparatus is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the apparatus is at least about 74.4 ksi after the radial expansion and plastic deformation.

299. The apparatus of claim 255, wherein the yield point of the predetermined portion of the apparatus after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the apparatus prior to the radial expansion and plastic deformation.

300. The apparatus of claim 255, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.04.

301. The apparatus of claim 255, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.92.

302. The apparatus of claim 255, wherein the anisotropy of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is at least about 1.34.

303. The apparatus of claim 255, wherein the anisotropy of the predetermined portion of the

apparatus, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

304. The apparatus of claim 255, wherein the yield point of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

305. The apparatus of claim 255, wherein the expandability coefficient of the predetermined portion of the apparatus, prior to the radial expansion and plastic deformation, is greater than 0.12.

306. The apparatus of claim 255, wherein the expandability coefficient of the predetermined portion of the apparatus is greater than the expandability coefficient of the other portion of the apparatus.

307. The apparatus of claim 255, wherein the apparatus comprises a wellbore casing.

308. The apparatus of claim 255, wherein the apparatus comprises a pipeline.

309. The apparatus of claim 255, wherein the apparatus comprises a structural support.

310. A method of joining radially expandable tubular members comprising:

providing a first tubular member;

engaging a second tubular member with the first tubular member to form a joint;

providing a sleeve;

mounting the sleeve for overlapping and coupling the first and second tubular members at the joint;

wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and

radially expanding and plastically deforming the tubular assembly;

wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

311. The method of claim 310, wherein the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

312. The method of claim 310, wherein the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

313. The method of claim 310, wherein the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

314. The method of claim 310, wherein the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly.

315. The method of claim 314, further comprising:

positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and

radially expanding and plastically deforming the other tubular assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly.

316. The method of claim 315, wherein the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly.

317. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly.

318. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly.

319. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly.

320. The method of claim 310, wherein the other portion of the tubular assembly comprises an end portion of the tubular assembly.

321. The method of claim 310, wherein the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly.

322. The method of claim 310, wherein the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly.

323. The method of claim 310, wherein the tubular assembly comprises a plurality of tubular

members coupled to one another by corresponding tubular couplings.

324. The method of claim 323, wherein the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly.

325. The method of claim 323, wherein one or more of the tubular couplings comprise the predetermined portions of the tubular assembly.

326. The method of claim 323, wherein one or more of the tubular members comprise the predetermined portions of the tubular assembly.

327. The method of claim 310, wherein the predetermined portion of the tubular assembly defines one or more openings.

328. The method of claim 327, wherein one or more of the openings comprise slots.

329. The method of claim 327, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

330. The method of claim 310, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

331. The method of claim 310, wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

332. The method of claim 310, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

333. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

334. The method of claim 333, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

335. The method of claim 333, wherein the yield point of the predetermined portion of the tubular

assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

336. The method of claim 333, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48.

337. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

338. The method of claim 337, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

339. The method of claim 337, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

340. The method of claim 337, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04.

341. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

342. The method of claim 341, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92.

343. The method of claim 310, wherein the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

344. The method of claim 343, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34.

345. The method of claim 310, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein

the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

346. The method of claim 310, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

347. The method of claim 310, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48.

348. The method of claim 310, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

349. The method of claim 310, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

350. The method of claim 310, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04.

351. The method of claim 310, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92.

352. The method of claim 310, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34.

353. The method of claim 310, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

354. The method of claim 310, wherein the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

355. The method of claim 310, wherein the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12.

356. The method of claim 310, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly.

357. The method of claim 310, wherein the tubular assembly comprises a wellbore casing.

358. The method of claim 310, wherein the tubular assembly comprises a pipeline.

359. The method of claim 310, wherein the tubular assembly comprises a structural support.

360. A method of joining radially expandable tubular members comprising:
providing a first tubular member;
engaging a second tubular member with the first tubular member to form a joint;
providing a sleeve having opposite tapered ends and a flange, one of the tapered ends being a surface formed on the flange;
mounting the sleeve for overlapping and coupling the first and second tubular members at the joint, wherein the flange is engaged in a recess formed in an adjacent one of the tubular members;
wherein the first tubular member, the second tubular member, and the sleeve define a tubular assembly; and
radially expanding and plastically deforming the tubular assembly;
wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

361. The method as defined in claim 360 further comprising:
providing a tapered wall in the recess for mating engagement with the tapered end formed on the flange.

362. The method as defined in claim 360 further comprising:
providing a flange at each tapered end wherein each tapered end is formed on a respective flange.

363. The method as defined in claim 362 further comprising:
providing a recess in each tubular member.

364. The method as defined in claim 363 further comprising:
engaging each flange in a respective one of the recesses.

365. The method as defined in claim 364 further comprising:

providing a tapered wall in each recess for mating engagement with the tapered end formed on a respective one of the flanges.

366. The method of claim 360, wherein the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

367. The method of claim 360, wherein the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

368. The method of claim 360, wherein the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

369. The method of claim 360, wherein the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly.

370. The method of claim 369, further comprising:

positioning another tubular assembly within the preexisting structure in overlapping relation to the tubular assembly; and

radially expanding and plastically deforming the other tubular assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly.

371. The method of claim 370, wherein the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly.

372. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly.

373. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly.

374. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly.

375. The method of claim 360, wherein the other portion of the tubular assembly comprises an end portion of the tubular assembly.

376. The method of claim 360, wherein the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly.

377. The method of claim 360, wherein the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly.

378. The method of claim 360, wherein the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

379. The method of claim 378, wherein the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly.

380. The method of claim 378, wherein one or more of the tubular couplings comprise the predetermined portions of the tubular assembly.

381. The method of claim 378, wherein one or more of the tubular members comprise the predetermined portions of the tubular assembly.

382. The method of claim 360, wherein the predetermined portion of the tubular assembly defines one or more openings.

383. The method of claim 382, wherein one or more of the openings comprise slots.

384. The method of claim 382, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

385. The method of claim 360, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

386. The method of claim 360, wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

387. The method of claim 360, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

388. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

389. The method of claim 388, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

390. The method of claim 388, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

391. The method of claim 388, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48.

392. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

393. The method of claim 392, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

394. The method of claim 392, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

395. The method of claim 392, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04.

396. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

397. The method of claim 396, wherein the anisotropy of the predetermined portion of the tubular

assembly, prior to the radial expansion and plastic deformation, is about 1.92.

398. The method of claim 360, wherein the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

399. The method of claim 398, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34.

400. The method of claim 360, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

401. The method of claim 360, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

402. The method of claim 360, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48.

403. The method of claim 360, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

404. The method of claim 360, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

405. The method of claim 360, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04.

406. The method of claim 360, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92.

407. The method of claim 360, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34.

408. The method of claim 360, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

409. The method of claim 360, wherein the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

491. The method of claim 360, wherein the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12.

492. The method of claim 360, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly.

493. The method of claim 360, wherein the tubular assembly comprises a wellbore casing.

494. The method of claim 360, wherein the tubular assembly comprises a pipeline.

495. The method of claim 360, wherein the tubular assembly comprises a structural support.

496. The apparatus of claim 205, wherein at least a portion of the sleeve is comprised of a frangible material.

497. The apparatus of claim 205, wherein the wall thickness of the sleeve is variable.

498. The method of claim 310, wherein at least a portion of the sleeve is comprised of a frangible material.

499. The method of claim 310, wherein the sleeve comprises a variable wall thickness.

500. The apparatus of claim 205, further comprising:
means for increasing the axial compression loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

501. The apparatus of claim 205, further comprising:
means for increasing the axial tension loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

502. The apparatus of claim 205, further comprising:
means for increasing the axial compression and tension loading capacity of the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

503. The apparatus of claim 205, further comprising:
means for avoiding stress risers in the joint between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

504. The apparatus of claim 205, further comprising:
means for inducing stresses at selected portions of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members.

505. The apparatus of claim 205, wherein the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

506. The method of claim 310, further comprising:
maintaining the sleeve in circumferential tension; and
maintaining the first and second tubular members in circumferential compression.

507. The apparatus of claim 205, wherein the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

508. The apparatus of claim 205, wherein the sleeve is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

509. The method of claim 310, further comprising:
maintaining the sleeve in circumferential tension; and
maintaining the first and second tubular members in circumferential compression.

510. The method of claim 310, further comprising:
maintaining the sleeve in circumferential tension; and
maintaining the first and second tubular members in circumferential compression.

511. The apparatus of claim 500, wherein the means for increasing the axial compression loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is

circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

512. The apparatus of claim 501, wherein the means for increasing the axial tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

513. The apparatus of claim 502, wherein the means for increasing the axial compression and tension loading capacity of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

514. The apparatus of claim 503, wherein the means for avoiding stress risers in the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

515. The apparatus of claim 504, wherein the means for inducing stresses at selected portions of the coupling between the first and second tubular members before and after a radial expansion and plastic deformation of the first and second tubular members is circumferentially tensioned; and wherein the first and second tubular members are circumferentially compressed.

516. An expandable tubular assembly, comprising:
a first tubular member;
a second tubular member coupled to the first tubular member;
a first threaded connection for coupling a portion of the first and second tubular members;
a second threaded connection spaced apart from the first threaded connection for coupling another portion of the first and second tubular members;
a tubular sleeve coupled to and receiving end portions of the first and second tubular members; and
a sealing element positioned between the first and second spaced apart threaded connections for sealing an interface between the first and second tubular member;

wherein the sealing element is positioned within an annulus defined between the first and second tubular members; and
wherein, prior to a radial expansion and plastic deformation of the assembly, a predetermined

portion of the assembly has a lower yield point than another portion of the apparatus.

517. The assembly of claim 516, wherein the predetermined portion of the assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

518. The assembly of claim 516, wherein the predetermined portion of the assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

519. The assembly of claim 516, wherein the predetermined portion of the assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

520. The assembly of claim 516, wherein the predetermined portion of the assembly has a larger inside diameter after the radial expansion and plastic deformation than other portions of the tubular assembly.

521. The assembly of claim 520, further comprising:

positioning another assembly within the preexisting structure in overlapping relation to the assembly; and

radially expanding and plastically deforming the other assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the assembly, a predetermined portion of the other assembly has a lower yield point than another portion of the other assembly.

522. The assembly of claim 521, wherein the inside diameter of the radially expanded and plastically deformed other portion of the assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other assembly.

523. The assembly of claim 516, wherein the predetermined portion of the assembly comprises an end portion of the assembly.

524. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a plurality of predetermined portions of the assembly.

525. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a plurality of spaced apart predetermined portions of the assembly.

526. The assembly of claim 516, wherein the other portion of the assembly comprises an end portion of the assembly.

527. The assembly of claim 516, wherein the other portion of the assembly comprises a plurality of other portions of the assembly.

528. The assembly of claim 516, wherein the other portion of the assembly comprises a plurality of spaced apart other portions of the assembly.

529. The assembly of claim 516, wherein the assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

530. The assembly of claim 529, wherein the tubular couplings comprise the predetermined portions of the assembly; and wherein the tubular members comprise the other portion of the assembly.

531. The assembly of claim 529, wherein one or more of the tubular couplings comprise the predetermined portions of the assembly.

532. The assembly of claim 529, wherein one or more of the tubular members comprise the predetermined portions of the assembly.

533. The assembly of claim 516, wherein the predetermined portion of the assembly defines one or more openings.

534. The assembly of claim 533, wherein one or more of the openings comprise slots.

535. The assembly of claim 533, wherein the anisotropy for the predetermined portion of the assembly is greater than 1.

536. The assembly of claim 516, wherein the anisotropy for the predetermined portion of the assembly is greater than 1.

537. The assembly of claim 516, wherein the strain hardening exponent for the predetermined portion of the assembly is greater than 0.12.

538. The assembly of claim 516, wherein the anisotropy for the predetermined portion of the assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the assembly is greater than 0.12.

539. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

540. The assembly of claim 539, wherein the yield point of the predetermined portion of the assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

541. The assembly of claim 539, wherein the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation.

542. The assembly of claim 539, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.48.

543. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

544. The assembly of claim 543, wherein the yield point of the predetermined portion of the assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

545. The assembly of claim 543, wherein the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation.

546. The assembly of claim 543, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.04.

547. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

548. The assembly of claim 547, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.92.

549. The assembly of claim 516, wherein the predetermined portion of the assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

550. The assembly of claim 549, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is about 1.34.

551. The assembly of claim 516, wherein the yield point of the predetermined portion of the assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

552. The assembly of claim 516, wherein the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation.

553. The assembly of claim 516, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.48.

554. The assembly of claim 516, wherein the yield point of the predetermined portion of the assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

555. The assembly of claim 516, wherein the yield point of the predetermined portion of the assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the assembly prior to the radial expansion and plastic deformation.

556. The assembly of claim 516, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.04.

557. The assembly of claim 516, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.92.

558. The assembly of claim 516, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is at least about 1.34.

559. The assembly of claim 516, wherein the anisotropy of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

560. The assembly of claim 516, wherein the yield point of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

561. The assembly of claim 516, wherein the expandability coefficient of the predetermined portion of the assembly, prior to the radial expansion and plastic deformation, is greater than 0.12.

562. The assembly of claim 516, wherein the expandability coefficient of the predetermined portion of the assembly is greater than the expandability coefficient of the other portion of the assembly.

563. The assembly of claim 516, wherein the assembly comprises a wellbore casing.

564. The assembly of claim 516, wherein the assembly comprises a pipeline.

565. The assembly of claim 516, wherein the assembly comprises a structural support.

566. The assembly of claim 516, wherein the annulus is at least partially defined by an irregular surface.

567. The assembly of claim 516, wherein the annulus is at least partially defined by a toothed surface.

568. The assembly of claim 516, wherein the sealing element comprises an elastomeric material.

569. The assembly of claim 516, wherein the sealing element comprises a metallic material.

570. The assembly of claim 516, wherein the sealing element comprises an elastomeric and a metallic material.

571. A method of joining radially expandable tubular members comprising:

providing a first tubular member;

providing a second tubular member;

providing a sleeve;

mounting the sleeve for overlapping and coupling the first and second tubular members;

threadably coupling the first and second tubular members at a first location;

threadably coupling the first and second tubular members at a second location spaced apart from the first location;

sealing an interface between the first and second tubular members between the first and second locations using a compressible sealing element, wherein the first tubular member, second tubular member, sleeve, and the sealing element define a tubular assembly; and

radially expanding and plastically deforming the tubular assembly;

wherein, prior to the radial expansion and plastic deformation, a predetermined portion of the tubular assembly has a lower yield point than another portion of the tubular assembly.

572. The method as defined in claim 571 wherein the sealing element includes an irregular surface.

573. The method as defined in claim 571, wherein the sealing element includes a toothed surface.

574. The method as defined in claim 571, wherein the sealing element comprises an elastomeric material.

575. The method as defined in claim 571, wherein the sealing element comprises a metallic material.

576. The method as defined in claim 571, wherein the sealing element comprises an elastomeric and a metallic material.

577. The method of claim 571, wherein the predetermined portion of the tubular assembly has a higher ductility and a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

578. The method of claim 571, wherein the predetermined portion of the tubular assembly has a higher ductility prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

579. The method of claim 571, wherein the predetermined portion of the tubular assembly has a lower yield point prior to the radial expansion and plastic deformation than after the radial expansion and plastic deformation.

580. The method of claim 571, wherein the predetermined portion of the tubular assembly has a larger inside diameter after the radial expansion and plastic deformation than the other portion of the tubular assembly.

581. The method of claim 571, further comprising:

positioning another tubular assembly within the preexisting structure in overlapping relation to

the tubular assembly; and

radially expanding and plastically deforming the other tubular assembly within the preexisting structure;

wherein, prior to the radial expansion and plastic deformation of the tubular assembly, a predetermined portion of the other tubular assembly has a lower yield point than another portion of the other tubular assembly.

582. The method of claim 581, wherein the inside diameter of the radially expanded and plastically deformed other portion of the tubular assembly is equal to the inside diameter of the radially expanded and plastically deformed other portion of the other tubular assembly.

583. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises an end portion of the tubular assembly.

584. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a plurality of predetermined portions of the tubular assembly.

585. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a plurality of spaced apart predetermined portions of the tubular assembly.

586. The method of claim 571, wherein the other portion of the tubular assembly comprises an end portion of the tubular assembly.

587. The method of claim 571, wherein the other portion of the tubular assembly comprises a plurality of other portions of the tubular assembly.

588. The method of claim 571, wherein the other portion of the tubular assembly comprises a plurality of spaced apart other portions of the tubular assembly.

589. The method of claim 571, wherein the tubular assembly comprises a plurality of tubular members coupled to one another by corresponding tubular couplings.

590. The method of claim 589, wherein the tubular couplings comprise the predetermined portions of the tubular assembly; and wherein the tubular members comprise the other portion of the tubular assembly.

591. The method of claim 589, wherein one or more of the tubular couplings comprise the predetermined portions of the tubular assembly.

592. The method of claim 589, wherein one or more of the tubular members comprise the

predetermined portions of the tubular assembly.

593. The method of claim 571, wherein the predetermined portion of the tubular assembly defines one or more openings.

594. The method of claim 593, wherein one or more of the openings comprise slots.

595. The method of claim 593, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

596. The method of claim 571, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1.

597. The method of claim 571, wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

598. The method of claim 571, wherein the anisotropy for the predetermined portion of the tubular assembly is greater than 1; and wherein the strain hardening exponent for the predetermined portion of the tubular assembly is greater than 0.12.

599. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a first steel alloy comprising: 0.065 % C, 1.44 % Mn, 0.01 % P, 0.002 % S, 0.24 % Si, 0.01 % Cu, 0.01 % Ni, and 0.02 % Cr.

600. The method of claim 599, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

601. The method of claim 599, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

602. The method of claim 599, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.48.

603. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a second steel alloy comprising: 0.18 % C, 1.28 % Mn, 0.017 % P, 0.004 % S, 0.29 % Si, 0.01 % Cu, 0.01 % Ni, and 0.03 % Cr.

604. The method of claim 603, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

605. The method of claim 603, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

606. The method of claim 603, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.04.

607. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a third steel alloy comprising: 0.08 % C, 0.82 % Mn, 0.006 % P, 0.003 % S, 0.30 % Si, 0.16 % Cu, 0.05 % Ni, and 0.05 % Cr.

608. The method of claim 607, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.92.

609. The method of claim 571, wherein the predetermined portion of the tubular assembly comprises a fourth steel alloy comprising: 0.02 % C, 1.31 % Mn, 0.02 % P, 0.001 % S, 0.45 % Si, 9.1 % Ni, and 18.7 % Cr.

610. The method of claim 609, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is about 1.34.

611. The method of claim 571, wherein the yield point of the predetermined portion of the tubular assembly is at most about 46.9 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 65.9 ksi after the radial expansion and plastic deformation.

612. The method of claim 571, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 40 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

613. The method of claim 571, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.48.

614. The method of claim 571, wherein the yield point of the predetermined portion of the tubular assembly is at most about 57.8 ksi prior to the radial expansion and plastic deformation; and wherein the yield point of the predetermined portion of the tubular assembly is at least about 74.4 ksi after the radial expansion and plastic deformation.

615. The method of claim 571, wherein the yield point of the predetermined portion of the tubular assembly after the radial expansion and plastic deformation is at least about 28 % greater than the yield point of the predetermined portion of the tubular assembly prior to the radial expansion and plastic deformation.

616. The method of claim 571, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.04.

617. The method of claim 571, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.92.

618. The method of claim 571, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is at least about 1.34.

619. The method of claim 571, wherein the anisotropy of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 1.04 to about 1.92.

620. The method of claim 571, wherein the yield point of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, ranges from about 47.6 ksi to about 61.7 ksi.

621. The method of claim 571, wherein the expandability coefficient of the predetermined portion of the tubular assembly, prior to the radial expansion and plastic deformation, is greater than 0.12.

622. The method of claim 571, wherein the expandability coefficient of the predetermined portion of the tubular assembly is greater than the expandability coefficient of the other portion of the tubular assembly.

623. The method of claim 571, wherein the tubular assembly comprises a wellbore casing.

624. The method of claim 571, wherein the tubular assembly comprises a pipeline.

625. The method of claim 571, wherein the tubular assembly comprises a structural support.

626. The apparatus of claim 205, wherein the sleeve comprises:
a plurality of spaced apart tubular sleeves coupled to and receiving end portions of the first and second tubular members.

627. The apparatus of claim 626, wherein the first tubular member comprises a first threaded connection; wherein the second tubular member comprises a second threaded connection; wherein the first and second threaded connections are coupled to one another; wherein at least one of the tubular sleeves is positioned in opposing relation to the first threaded connection; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded connection.

628. The apparatus of claim 626, wherein the first tubular member comprises a first threaded connection; wherein the second tubular member comprises a second threaded connection; wherein the first and second threaded connections are coupled to one another; and wherein at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded connections.

629. The method of claim 310, further comprising:
threadably coupling the first and second tubular members at a first location;
threadably coupling the first and second tubular members at a second location spaced apart from the first location;
providing a plurality of sleeves; and
mounting the sleeves at spaced apart locations for overlapping and coupling the first and second tubular members.

630. The method of claim 629, wherein at least one of the tubular sleeves is positioned in opposing relation to the first threaded coupling; and wherein at least one of the tubular sleeves is positioned in opposing relation to the second threaded coupling.

631. The method of claim 629, wherein at least one of the tubular sleeves is not positioned in opposing relation to the first and second threaded couplings.

632. The apparatus of claim 205, further comprising:
a threaded connection for coupling a portion of the first and second tubular members;
wherein at least a portion of the threaded connection is upset.

633. The apparatus of claim 632, wherein at least a portion of tubular sleeve penetrates the first tubular member.

634. The method of claim 310, further comprising:
threadably coupling the first and second tubular members; and
upsetting the threaded coupling.

635. The apparatus of claim 205, wherein the first tubular member further comprises an annular extension extending therefrom; and wherein the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member.

636. The method of claim 310, wherein the first tubular member further comprises an annular extension extending therefrom; and wherein the flange of the sleeve defines an annular recess for receiving and mating with the annular extension of the first tubular member.

637. The apparatus of claim 205, further comprising:
one or more stress concentrators for concentrating stresses in the joint.

638. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member.

639. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member.

640. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve.

641. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member.

642. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve.

643. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve.

644. The apparatus as defined in claim 637, wherein one or more of the stress concentrators comprises one or more external grooves defined in the first tubular member; wherein one or more of the stress concentrators comprises one or more internal grooves defined in the second tubular member; and wherein one or more of the stress concentrators comprises one or more openings defined in the sleeve.

645. The method of claim 310, further comprising:
concentrating stresses within the joint.

646. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the first tubular member to concentrate stresses within the joint.

647. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the second tubular member to concentrate stresses within the joint.

648. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the sleeve to concentrate stresses within the joint.

649. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the first tubular member and the second tubular member to concentrate stresses within the joint.

650. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the first tubular member and the sleeve to concentrate stresses within the joint.

651. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the second tubular member and the sleeve to concentrate stresses within the joint.

652. The method as defined in claim 645, wherein concentrating stresses within the joint comprises using the first tubular member, the second tubular member, and the sleeve to concentrate stresses within the joint.

653. The apparatus of claim 205, further comprising:
means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members.

654. The apparatus of claim 205, further comprising:
means for concentrating stresses within the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members.

655. The apparatus of claim 205, further comprising:

means for maintaining portions of the first and second tubular member in circumferential compression following the radial expansion and plastic deformation of the first and second tubular members; and

means for concentrating stresses within the mechanical connection during the radial expansion and plastic deformation of the first and second tubular members.

656. The method of claim 310, further comprising:

maintaining portions of the first and second tubular member in circumferential compression following a radial expansion and plastic deformation of the first and second tubular members.

657. The method of claim 310, further comprising:

concentrating stresses within the joint during a radial expansion and plastic deformation of the first and second tubular members.

658. The method of claim 310, further comprising:

maintaining portions of the first and second tubular member in circumferential compression following a radial expansion and plastic deformation of the first and second tubular members; and

concentrating stresses within the joint during a radial expansion and plastic deformation of the first and second tubular members.

659. The method of claim 1, wherein the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21.

660. The method of claim 1, wherein the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36.

661. An expandable tubular member, wherein the carbon content of the tubular member is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.21.

662. The tubular member of claim 661, wherein the tubular member comprises a wellbore casing.

663. An expandable tubular member, wherein the carbon content of the tubular member is greater than 0.12 percent; and wherein the carbon equivalent value for the tubular member is less than 0.36.

664. The tubular member of claim 663, wherein the tubular member comprises a wellbore casing.

665. The apparatus of claim 142, wherein the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21.

666. The apparatus of claim 142, wherein the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36.

667. A method of selecting tubular members for radial expansion and plastic deformation, comprising:

selecting a tubular member from a collection of tubular member;

determining a carbon content of the selected tubular member;

determining a carbon equivalent value for the selected tubular member; and

if the carbon content of the selected tubular member is less than or equal to 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.21, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

668. A method of selecting tubular members for radial expansion and plastic deformation, comprising:

selecting a tubular member from a collection of tubular member;

determining a carbon content of the selected tubular member;

determining a carbon equivalent value for the selected tubular member; and

if the carbon content of the selected tubular member is greater than 0.12 percent and the carbon equivalent value for the selected tubular member is less than 0.36, then determining that the selected tubular member is suitable for radial expansion and plastic deformation.

669. The apparatus of claim 205, wherein the carbon content of the predetermined portion of the apparatus is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the apparatus is less than 0.21.

670. The apparatus of claim 205, wherein the carbon content of the predetermined portion of the apparatus is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the apparatus is less than 0.36.

671. The method of claim 310, wherein the carbon content of the predetermined portion of the tubular assembly is less than or equal to 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.21.

672. The method of claim 310, wherein the carbon content of the predetermined portion of the tubular assembly is greater than 0.12 percent; and wherein the carbon equivalent value for the predetermined portion of the tubular assembly is less than 0.36.

673. An expandable tubular member, comprising:
a tubular body;
wherein a yield point of an inner tubular portion of the tubular body is less than a yield point of an outer tubular portion of the tubular body.

674. The expandable tubular member of claim 673, wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body.

675. The expandable tubular member of claim 674, wherein the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

676. The expandable tubular member of claim 674, wherein the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

677. The expandable tubular member of claim 673, wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

678. The expandable tubular member of claim 677, wherein the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

679. The expandable tubular member of claim 677, wherein the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

680. The expandable tubular member of claim 673,
wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and
wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

681. The expandable tubular member of claim 680, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the

tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

682. The expandable tubular member of claim 680, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

683. The expandable tubular member of claim 680, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

684. The expandable tubular member of claim 680, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

685. The expandable tubular member of claim 680, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

686. The expandable tubular member of claim 680, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

687. The method of claim 1, wherein a yield point of an inner tubular portion of at least a portion of the tubular assembly is less than a yield point of an outer tubular portion of the portion of the tubular assembly.

688. The method of claim 687, wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body.

689. The method of claim 688, wherein the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

690. The method of claim 688, wherein the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

691. The method of claim 687, wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

692. The method of claim 691, wherein the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

693. The method of claim 691, wherein the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

694. The method of claim 687, wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

695. The method of claim 694, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

696. The method of claim 694, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

697. The method of claim 694, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

698. The method of claim 694, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

699. The method of claim 694, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

700. The method of claim 694, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

701. The apparatus of claim 142, wherein a yield point of an inner tubular portion of at least a portion of the tubular assembly is less than a yield point of an outer tubular portion of the portion of the tubular assembly.

702. The apparatus of claim 701, wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body.

703. The apparatus of claim 702, wherein the yield point of the inner tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

704. The apparatus of claim 702, wherein the yield point of the inner tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

705. The apparatus of claim 701, wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

706. The apparatus of claim 705, wherein the yield point of the outer tubular portion of the tubular body varies in an linear fashion as a function of the radial position within the tubular body.

707. The apparatus of claim 705, wherein the yield point of the outer tubular portion of the tubular body varies in an non-linear fashion as a function of the radial position within the tubular body.

708. The apparatus of claim 701, wherein the yield point of the inner tubular portion of the tubular body varies as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies as a function of the radial position within the tubular body.

709. The apparatus of claim 708, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

710. The apparatus of claim 708, wherein the yield point of the inner tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

711. The apparatus of claim 708, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a linear fashion as a function of the radial position within the tubular body.

712. The apparatus of claim 708, wherein the yield point of the inner tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body; and wherein the yield point of the outer tubular portion of the tubular body varies in a non-linear fashion as a function of the radial position within the tubular body.

713. The apparatus of claim 708, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

714. The apparatus of claim 708, wherein the rate of change of the yield point of the inner tubular portion of the tubular body is different than the rate of change of the yield point of the outer tubular portion of the tubular body.

715. The method of claim 1, wherein prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure.

716. The method of claim 715, wherein prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a transitional phase structure.

717. The method of claim 715, wherein the hard phase structure comprises martensite.

718. The method of claim 715, wherein the soft phase structure comprises ferrite.

719. The method of claim 715, wherein the transitional phase structure comprises retained austentite.

720. The method of claim 715, wherein the hard phase structure comprises martensite; wherein the soft phase structure comprises ferrite; and wherein the transitional phase structure comprises retained austentite.

721. The method of claim 715, wherein the portion of the tubular assembly comprising a microstructure comprising a hard phase structure and a soft phase structure comprises, by weight percentage, about 0.1% C, about 1.2% Mn, and about 0.3% Si.

722. The apparatus of claim 142, wherein at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure.

723. The apparatus of claim 722, wherein prior to the radial expansion and plastic deformation, at least a portion of the tubular assembly comprises a microstructure comprising a transitional phase structure.

724. The apparatus of claim 722, wherein the hard phase structure comprises martensite.

725. The apparatus of claim 722, wherein the soft phase structure comprises ferrite.

726. The apparatus of claim 722, wherein the transitional phase structure comprises retained austentite.

727. The apparatus of claim 722, wherein the hard phase structure comprises martensite; wherein the soft phase structure comprises ferrite; and wherein the transitional phase structure comprises retained austentite.

728. The apparatus of claim 722, wherein the portion of the tubular assembly comprising a microstructure comprising a hard phase structure and a soft phase structure comprises, by weight percentage, about 0.1% C, about 1.2% Mn, and about 0.3% Si.

729. A method of manufacturing an expandable tubular member, comprising:
providing a tubular member;
heat treating the tubular member; and
quenching the tubular member;
wherein following the quenching, the tubular member comprises a microstructure comprising a hard phase structure and a soft phase structure.

730. The method of claim 729, wherein the provided tubular member comprises, by weight percentage, 0.065% C, 1.44% Mn, 0.01% P, 0.002% S, 0.24% Si, 0.01% Cu, 0.01% Ni, 0.02% Cr, 0.05% V, 0.01% Mo, 0.01% Nb, and 0.01%Ti.

731. The method of claim 729, wherein the provided tubular member comprises, by weight percentage, 0.18% C, 1.28% Mn, 0.017% P, 0.004% S, 0.29% Si, 0.01% Cu, 0.01% Ni, 0.03% Cr, 0.04% V, 0.01% Mo, 0.03% Nb, and 0.01%Ti.

732. The method of claim 729, wherein the provided tubular member comprises, by weight percentage, 0.08% C, 0.82% Mn, 0.006% P, 0.003% S, 0.30% Si, 0.06% Cu, 0.05% Ni, 0.05% Cr, 0.03% V, 0.03% Mo, 0.01% Nb, and 0.01%Ti.

733. The method of claim 729, wherein the provided tubular member comprises a microstructure comprising one or more of the following: martensite, pearlite, vanadium carbide, nickel carbide, or titanium carbide.

734. The method of claim 729, wherein the provided tubular member comprises a microstructure comprising one or more of the following: pearlite or pearlite striation.

735. The method of claim 729, wherein the provided tubular member comprises a microstructure comprising one or more of the following: grain pearlite, widmanstatten martensite, vanadium carbide, nickel carbide, or titanium carbide.

736. The method of claim 729, wherein the heat treating comprises heating the provided tubular member for about 10 minutes at 790 °C.

737. The method of claim 729, wherein the quenching comprises quenching the heat treated tubular member in water.

738. The method of claim 729, wherein following the quenching, the tubular member comprises a microstructure comprising one or more of the following: ferrite, grain pearlite, or martensite.

739. The method of claim 729, wherein following the quenching, the tubular member comprises a microstructure comprising one or more of the following: ferrite, martensite, or bainite.

740. The method of claim 729, wherein following the quenching, the tubular member comprises a microstructure comprising one or more of the following: bainite, pearlite, or ferrite.

741. The method of claim 729, wherein following the quenching, the tubular member comprises a yield strength of about 67ksi and a tensile strength of about 95 ksi.

742. The method of claim 729, wherein following the quenching, the tubular member comprises a yield strength of about 82 ksi and a tensile strength of about 130 ksi.

743. The method of claim 729, wherein following the quenching, the tubular member comprises a yield strength of about 60 ksi and a tensile strength of about 97 ksi.

744. The method of claim 729, further comprising:
positioning the quenched tubular member within a preexisting structure; and
radially expanding and plastically deforming the tubular member within the preexisting structure.

745. The apparatus of claim 142, wherein at least a portion of the tubular assembly comprises a microstructure comprising a hard phase structure and a soft phase structure.

746. The apparatus of claim 745, wherein the portion of the tubular assembly comprises, by weight percentage, 0.065% C, 1.44% Mn, 0.01% P, 0.002% S, 0.24% Si, 0.01% Cu, 0.01% Ni, 0.02% Cr, 0.05% V, 0.01% Mo, 0.01% Nb, and 0.01%Ti.

747. The apparatus of claim 745, wherein the portion of the tubular assembly comprises, by weight percentage, 0.18% C, 1.28% Mn, 0.017% P, 0.004% S, 0.29% Si, 0.01% Cu, 0.01% Ni, 0.03% Cr, 0.04% V, 0.01% Mo, 0.03% Nb, and 0.01%Ti.

748. The apparatus of claim 745, wherein the portion of the tubular assembly comprises, by weight percentage, 0.08% C, 0.82% Mn, 0.006% P, 0.003% S, 0.30% Si, 0.06% Cu, 0.05% Ni, 0.05% Cr, 0.03% V, 0.03% Mo, 0.01% Nb, and 0.01%Ti.

749. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: martensite, pearlite, vanadium carbide, nickel carbide, or titanium carbide.

750. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: pearlite or pearlite striation.

751. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: grain pearlite, widmanstatten martensite, vanadium carbide, nickel carbide, or titanium carbide.

752. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: ferrite, grain pearlite, or martensite.

753. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: ferrite, martensite, or bainite.

754. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a microstructure comprising one or more of the following: bainite, pearlite, or ferrite.

755. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a yield strength of about 67ksi and a tensile strength of about 95 ksi.

756. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a yield strength of about 82 ksi and a tensile strength of about 130 ksi.

757. The apparatus of claim 745, wherein the portion of the tubular assembly comprises a yield strength of about 60 ksi and a tensile strength of about 97 ksi.

758. A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member comprising:

forming the expandable member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

759. An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member, comprising:

a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

760. A structural completion positioned within a structure, comprising:

one or more radially expanded and plastically deformed expandable members positioned within the structure;

wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a charpy energy of at least about 90 ft-lbs.

761. A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member, comprising:

forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

762. An expandable member for use in completing a wellbore by radially expanding and plastically deforming the expandable member at a downhole location in the wellbore, comprising:

a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

763. A structural completion, comprising:

one or more radially expanded and plastically deformed expandable members positioned within the wellbore;

wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.08%.

764. A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member, comprising:

forming the expandable member from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

765. An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member, comprising:

a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

766. A structural completion, comprising:

one or more radially expanded and plastically deformed expandable members;

wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising a weight percentage of carbon of less than about 0.20% and a charpy V-notch impact toughness of at least about 6 joules.

767. A method for manufacturing an expandable member used to complete a structure by radially expanding and plastically deforming the expandable member, comprising:

forming the expandable member from a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;
Si, from about 0.009 to about 0.30;
Mn, from about 0.10 to about 1.92;
P, from about 0.004 to about 0.07;
S, from about 0.0008 to about 0.006;
Al, up to about 0.04;
N, up to about 0.01;
Cu, up to about 0.3;
Cr, up to about 0.5;
Ni, up to about 18;
Nb, up to about 0.12;
Ti, up to about 0.6;
Co, up to about 9; and
Mo, up to about 5.

768. An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member, comprising:

a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;

Si, from about 0.009 to about 0.30;

Mn, from about 0.10 to about 1.92;

P, from about 0.004 to about 0.07;

S, from about 0.0008 to about 0.006;

Al, up to about 0.04;

N, up to about 0.01;

Cu, up to about 0.3;

Cr, up to about 0.5;

Ni, up to about 18;

Nb, up to about 0.12;

Ti, up to about 0.6;

Co, up to about 9; and

Mo, up to about 5.

769. A structural completion, comprising:

one or more radially expanded and plastically deformed expandable members;

wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;

Si, from about 0.009 to about 0.30;

Mn, from about 0.10 to about 1.92;

P, from about 0.004 to about 0.07;

S, from about 0.0008 to about 0.006;

Al, up to about 0.04;

N, up to about 0.01;

Cu, up to about 0.3;

Cr, up to about 0.5;

Ni, up to about 18;

Nb, up to about 0.12;

Ti, up to about 0.6;

Co, up to about 9; and

Mo, up to about 5.

770. A method for manufacturing an expandable tubular member used to complete a structure by radially expanding and plastically deforming the expandable member, comprising:

forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

771. An expandable member for use in completing a structure by radially expanding and plastically deforming the expandable member, comprising:

an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

772. A structural completion, comprising:

one or more radially expanded and plastically deformed expandable members positioned within the structure;

wherein one or more of the radially expanded and plastically deformed expandable members are fabricated from an expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22.

773. A method of constructing a structure, comprising:

radially expanding and plastically deforming an expandable member;

wherein an outer portion of the wall thickness of the radially expanded and plastically deformed expandable member comprises tensile residual stresses.

774. A structural completion, comprising:

one or more radially expanded and plastically deformed expandable members;

wherein an outer portion of the wall thickness of one or more of the radially expanded and plastically deformed expandable members comprises tensile residual stresses.

775. A method of constructing a structure using an expandable tubular member, comprising:

strain aging the expandable member; and

then radially expanding and plastically deforming the expandable member.

776. A method for manufacturing a tubular member used to complete a wellbore by radially expanding the tubular member at a downhole location in the wellbore comprising: forming a steel alloy comprising a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy.

777. The method of claim 776, further comprising forming the steel alloy with a concentration of niobium comprising between approximately 0.015% and 0.12% by weight of the steel alloy.

778. The method of claim 776, further comprising: forming the steel alloy with low concentrations of niobium and titanium; and limiting the total concentration of niobium and titanium to less than approximately 0.6% by weight of the steel alloy.

779. An expandable tubular member fabricated from a steel alloy having a concentration of carbon between approximately 0.002% and 0.08% by weight of the steel alloy.

780. A method for manufacturing an expandable tubular member used to complete a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore, comprising:

forming the expandable tubular member from a steel alloy comprising a charpy energy of at least about 90 ft-lbs;

forming the expandable member from a steel alloy comprising a charpy V-notch impact toughness of at least about 6 joules;

forming the expandable member from a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;
Si, from about 0.009 to about 0.30;
Mn, from about 0.10 to about 1.92;
P, from about 0.004 to about 0.07;
S, from about 0.0008 to about 0.006;
Al, up to about 0.04;
N, up to about 0.01;
Cu, up to about 0.3;
Cr, up to about 0.5;
Ni, up to about 18;
Nb, up to about 0.12;
Ti, up to about 0.6;
Co, up to about 9; and
Mo, up to about 5;

forming the expandable tubular member with a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and

strain aging the expandable tubular member prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

781. An expandable tubular member for use in completing a wellbore completion within a wellbore that traverses a subterranean formation by radially expanding and plastically deforming the expandable tubular member within the wellbore, comprising:

a steel alloy having a charpy energy of at least about 90 ft-lbs;

a steel alloy having a charpy V-notch impact toughness of at least about 6 joules; and

a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;

Si, from about 0.009 to about 0.30;

Mn, from about 0.10 to about 1.92;

P, from about 0.004 to about 0.07;

S, from about 0.0008 to about 0.006;

Al, up to about 0.04;

N, up to about 0.01;

Cu, up to about 0.3;

Cr, up to about 0.5;

Ni, up to about 18;

Nb, up to about 0.12;

Ti, up to about 0.6;

Co, up to about 9; and

Mo, up to about 5;

wherein a ratio of the of an outside diameter of the expandable tubular member to a wall thickness of the expandable tubular member ranging from about 12 to 22; and

wherein the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

782. A wellbore completion positioned within a wellbore that traverses a subterranean formation, comprising:

one or more radially expanded and plastically deformed expandable tubular members positioned within the wellbore completion;

wherein one or more of the radially expanded and plastically deformed expandable tubular members are fabricated from:

a steel alloy comprising a charpy energy of at least about 90 ft-lbs;

a steel alloy comprising a charpy V-notch impact toughness of at least about 6 joules; and

a steel alloy comprising the following ranges of weight percentages:

C, from about 0.002 to about 0.08;

Si, from about 0.009 to about 0.30;

Mn, from about 0.10 to about 1.92;

P, from about 0.004 to about 0.07;

S, from about 0.0008 to about 0.006;

Al, up to about 0.04;

N, up to about 0.01;

Cu, up to about 0.3;

Cr, up to about 0.5;

Ni, up to about 18;

Nb, up to about 0.12;

Ti, up to about 0.6;

Co, up to about 9; and

Mo, up to about 5;

wherein at least one of the expandable members comprises a ratio of the of an outside diameter of the expandable member to a wall thickness of the expandable member ranging from about 12 to 22;

wherein an outer portion of the wall thickness of at least one of the radially expanded and plastically deformed expandable comprises tensile residual stresses; and

wherein at least one of the expandable tubular member is strain aged prior to the radial expansion and plastic deformation of the expandable tubular member within the wellbore.

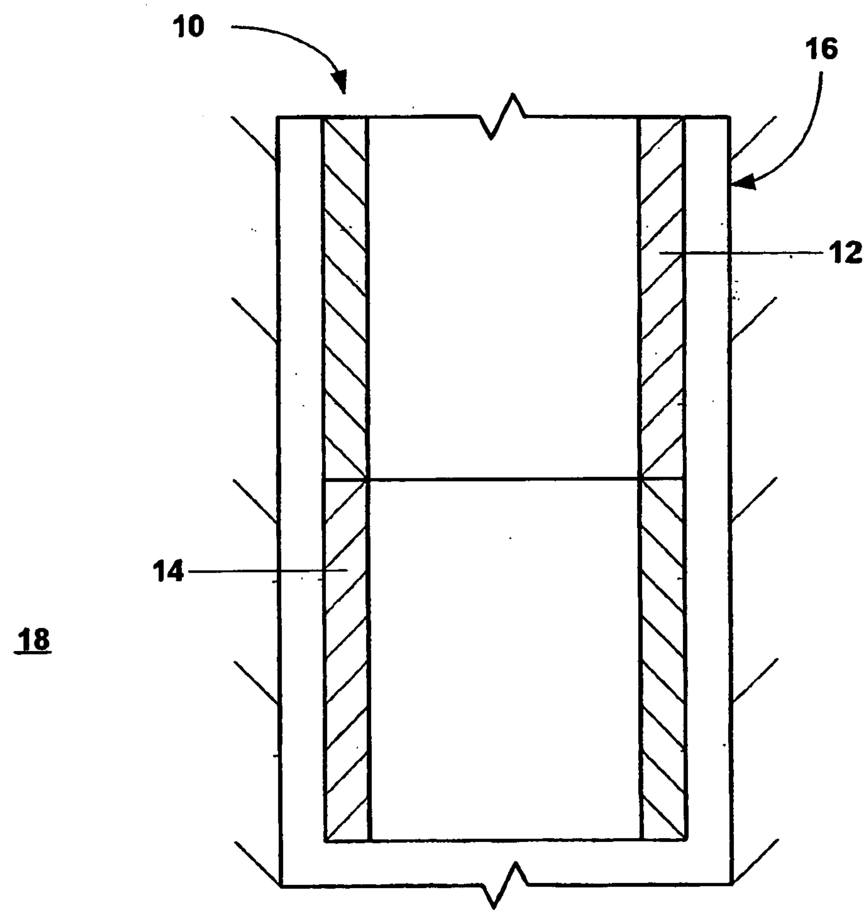


FIG. 1

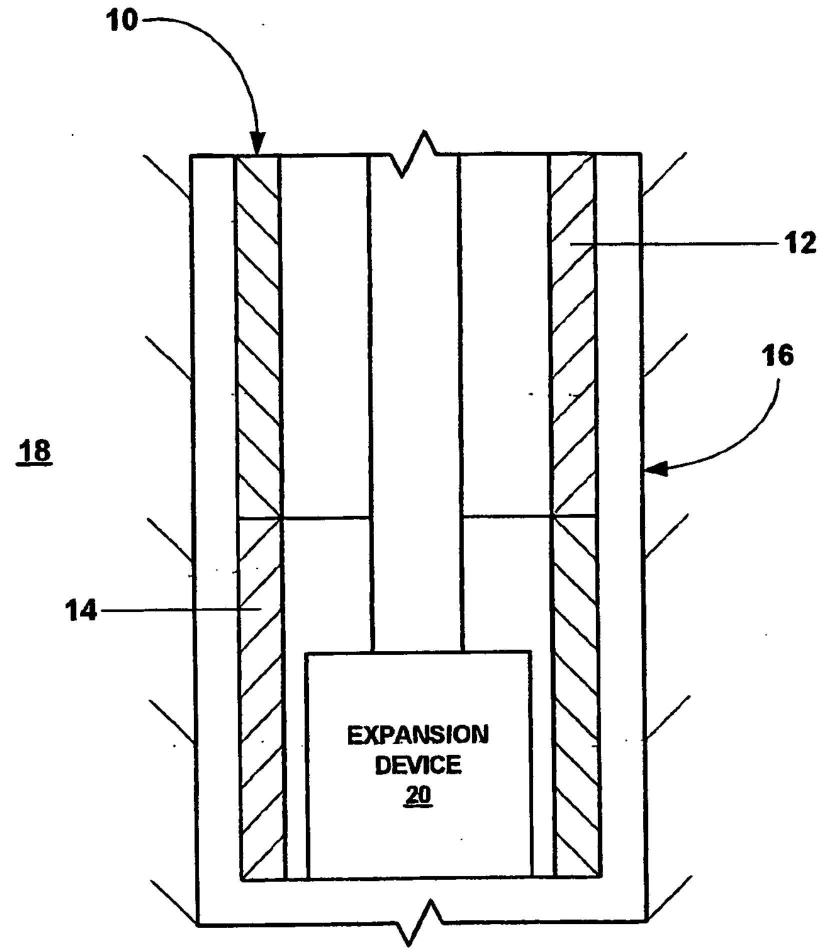


FIG. 2

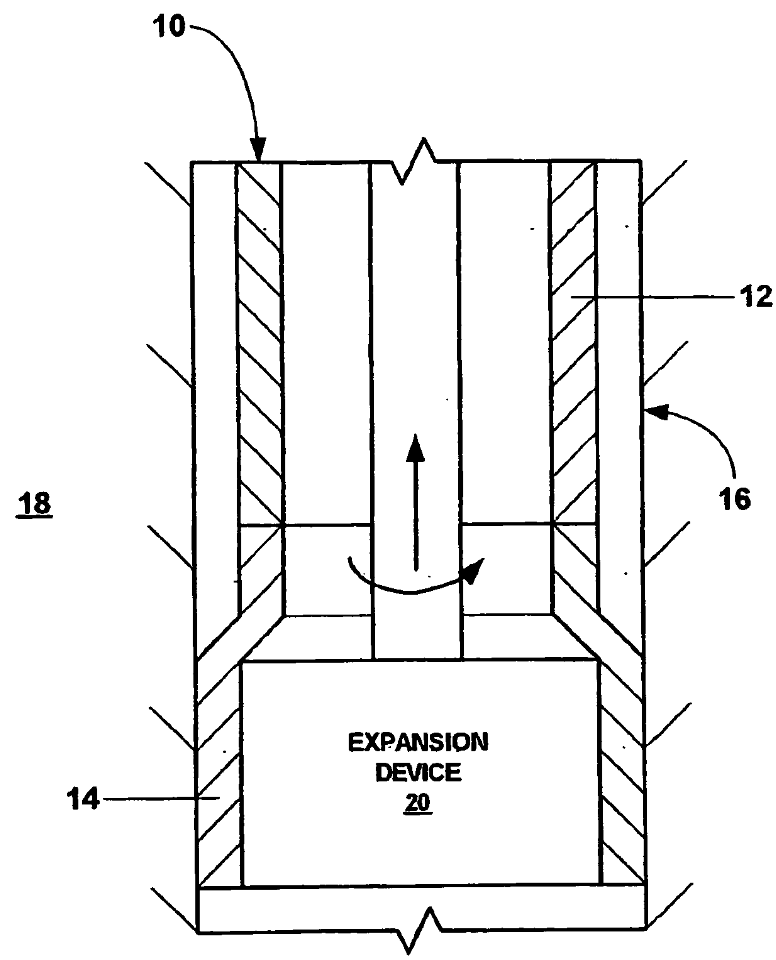


FIG. 3

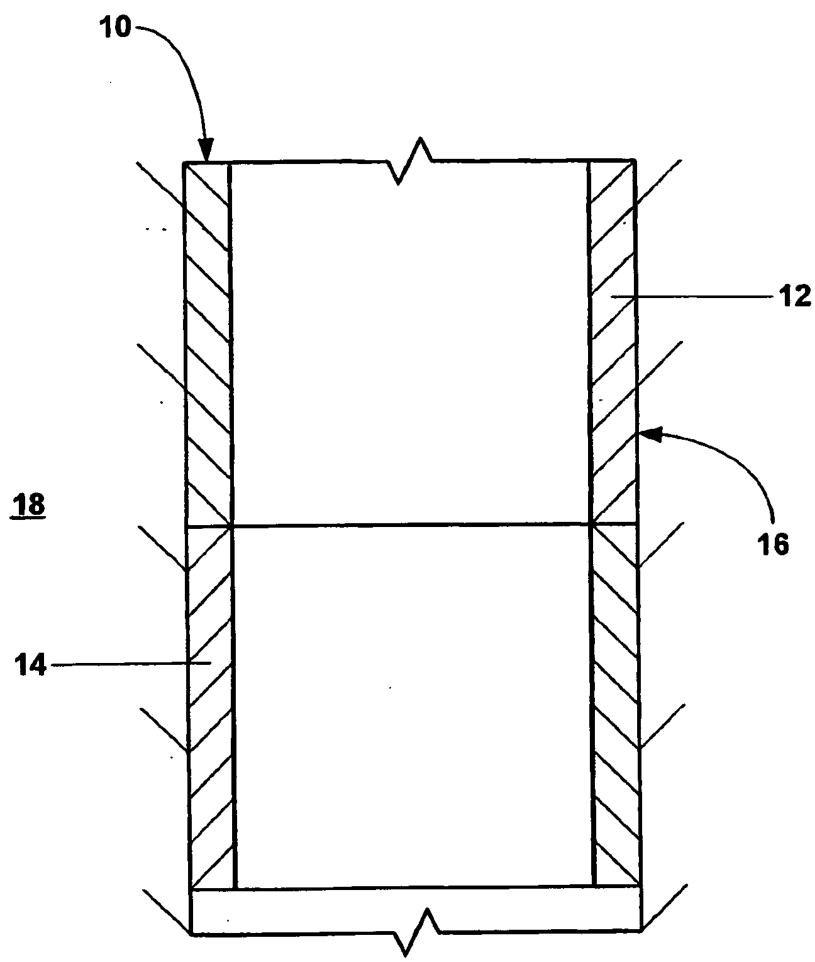


FIG. 4

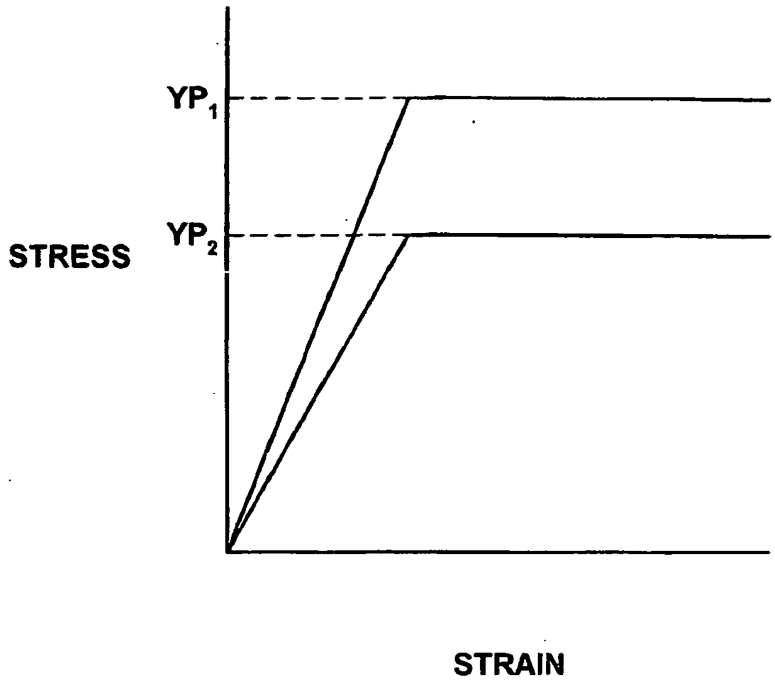

YP$_1$
YP$_2$
STRESS
STRAIN

FIG. 5

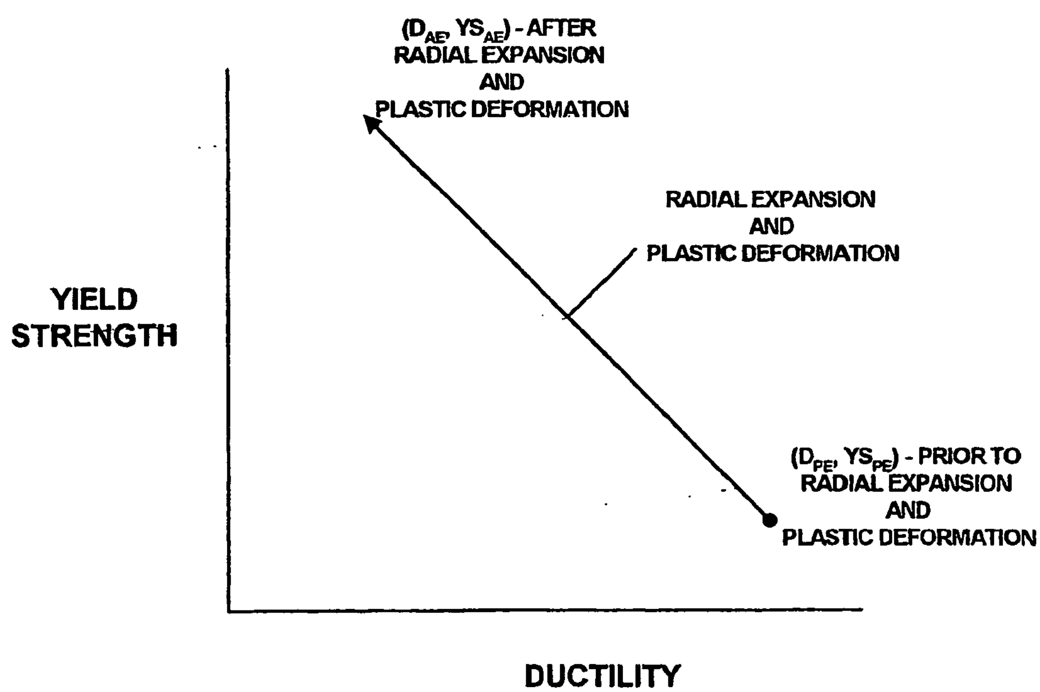

(D_{AE}, YS_{AE}) - AFTER RADIAL EXPANSION AND PLASTIC DEFORMATION
RADIAL EXPANSION AND PLASTIC DEFORMATION
YIELD STRENGTH
(D_{PE}, YS_{PE}) - PRIOR TO RADIAL EXPANSION AND PLASTIC DEFORMATION
DUCTILITY

FIG. 6

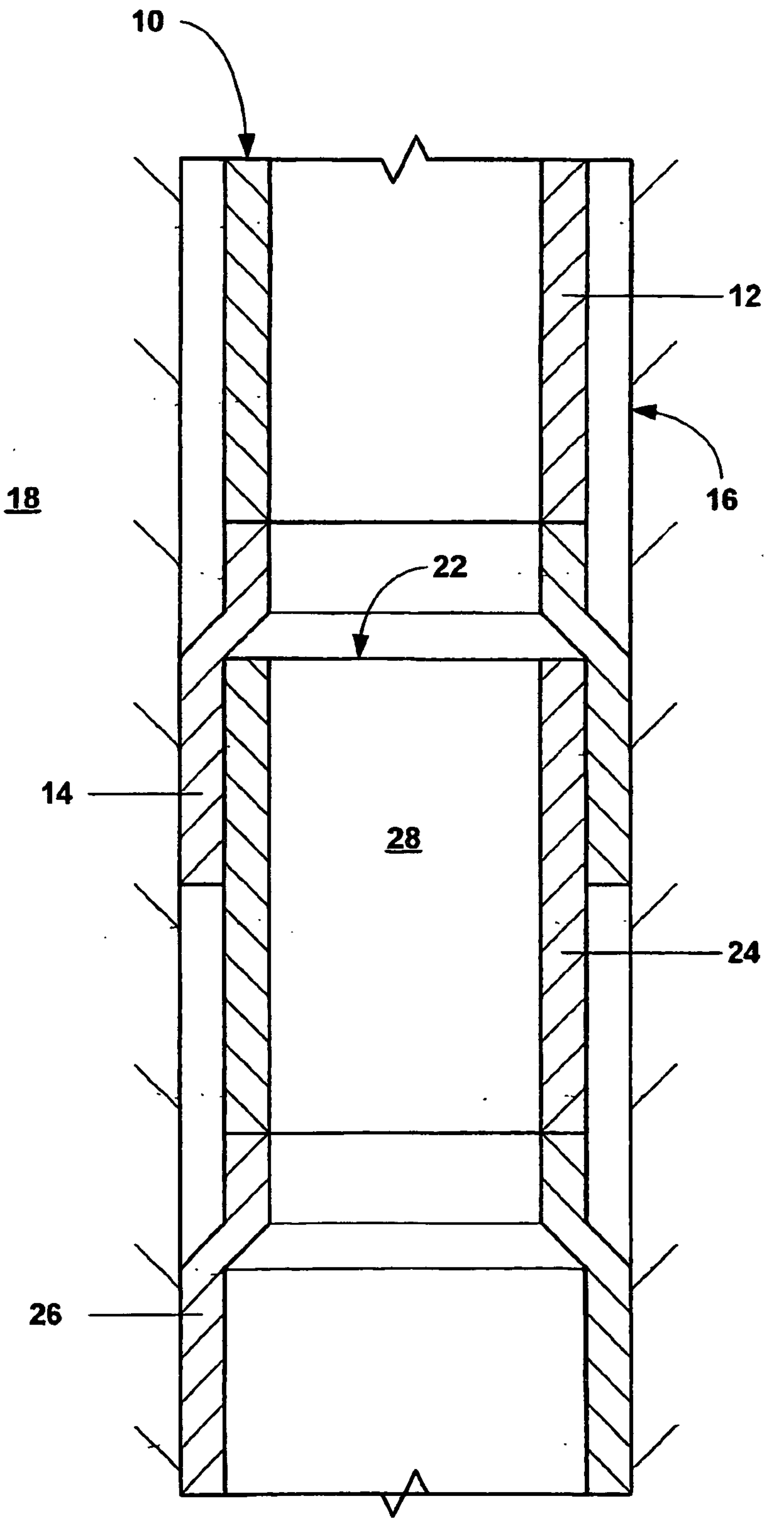


FIG. 7

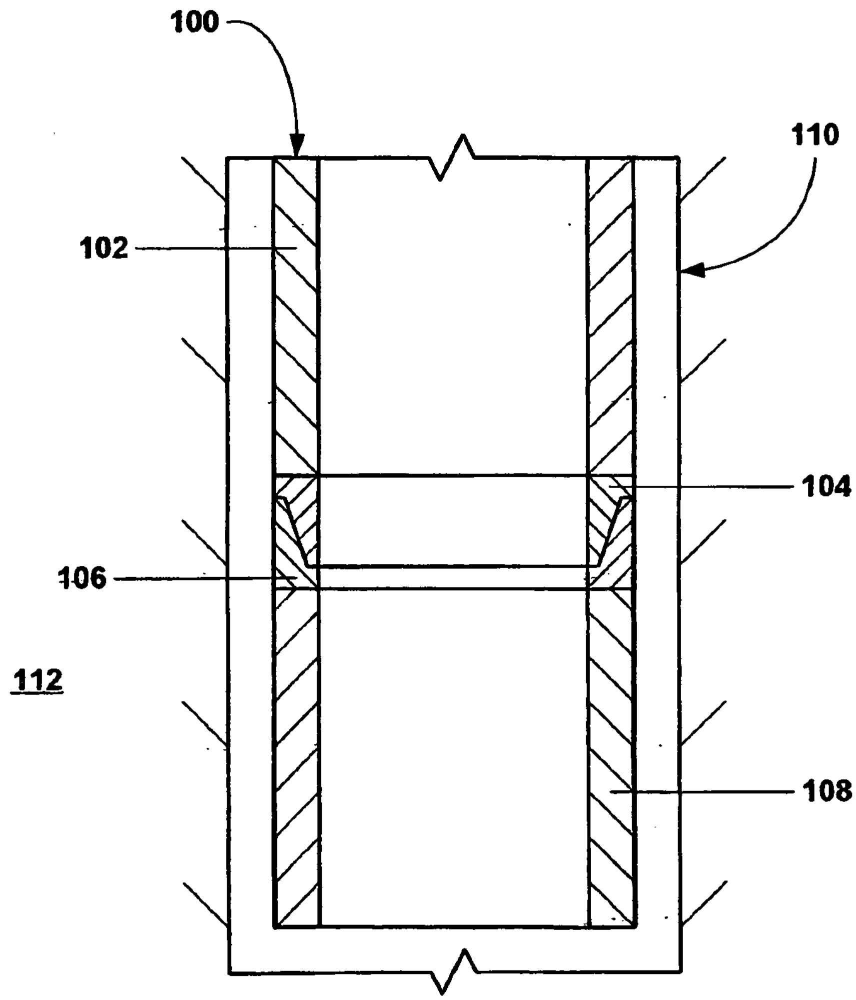


FIG. 8

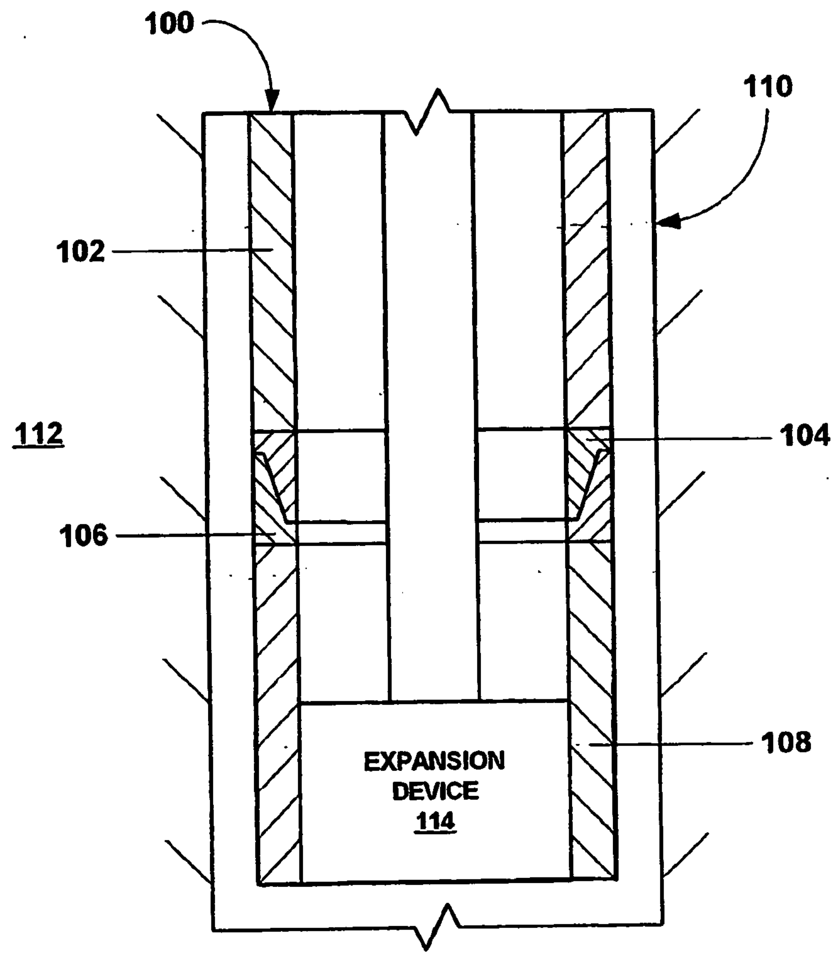


FIG. 9

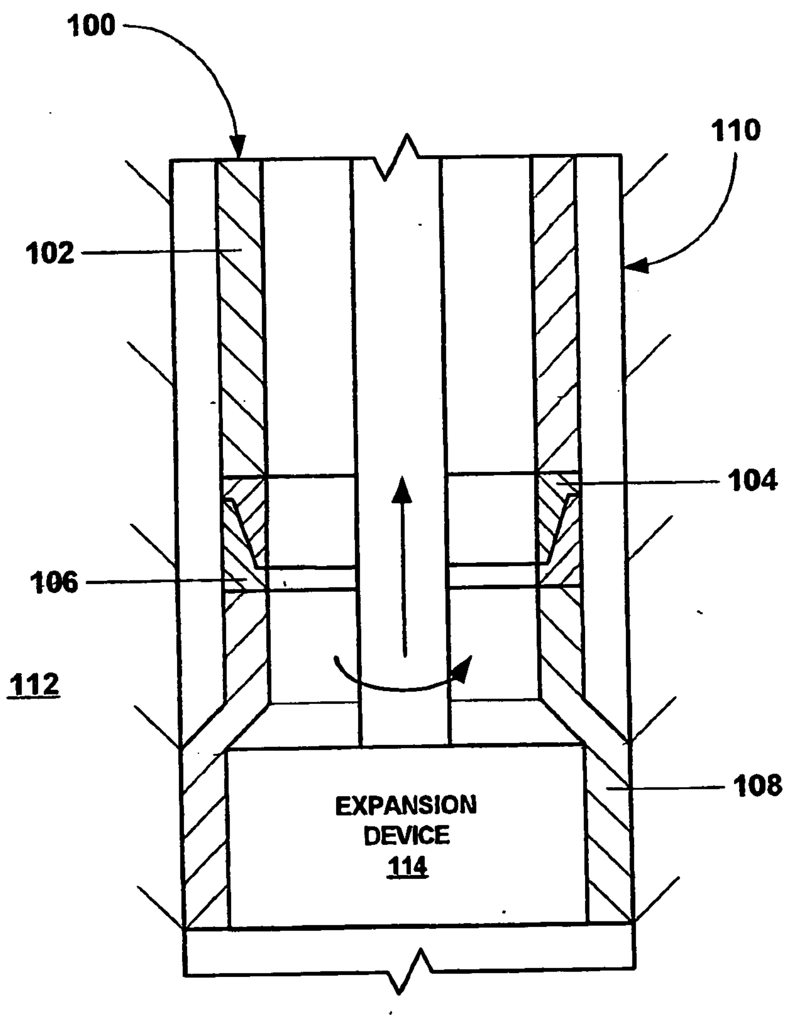


FIG. 10

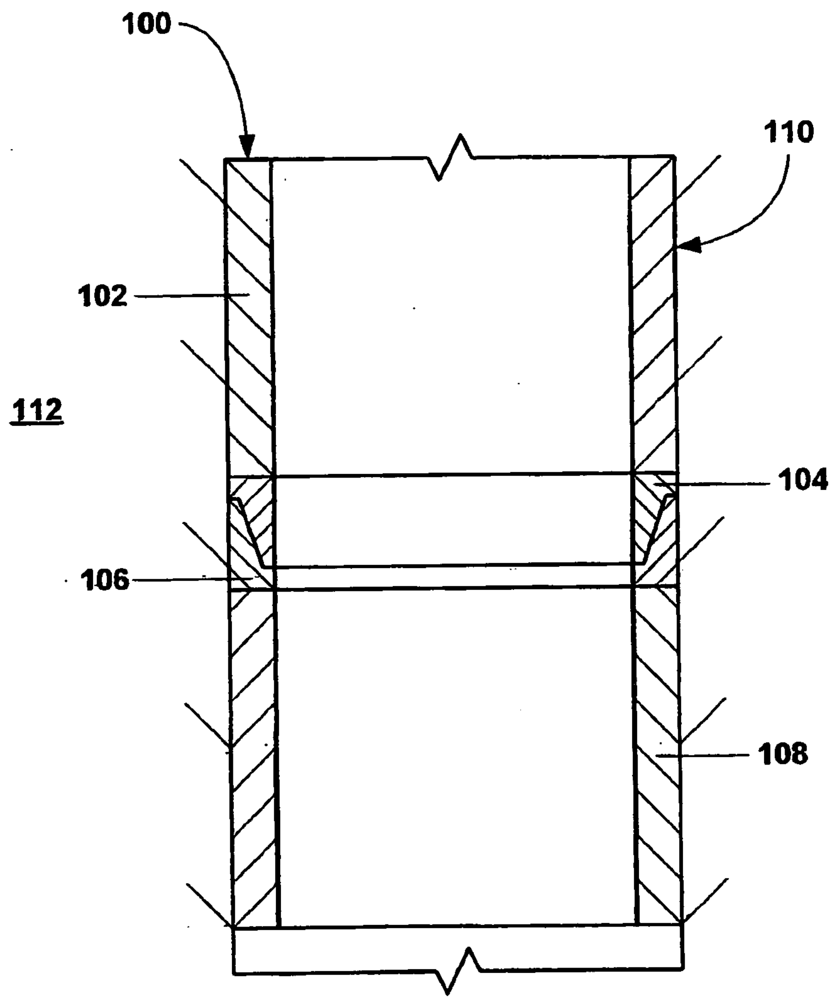


FIG. 11

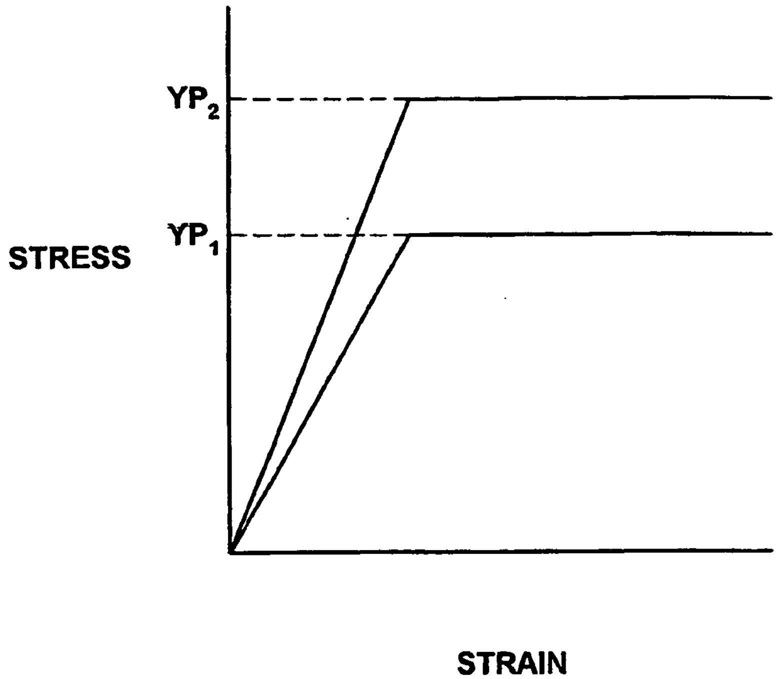

YP$_2$
YP$_1$
STRESS
STRAIN

FIG. 12

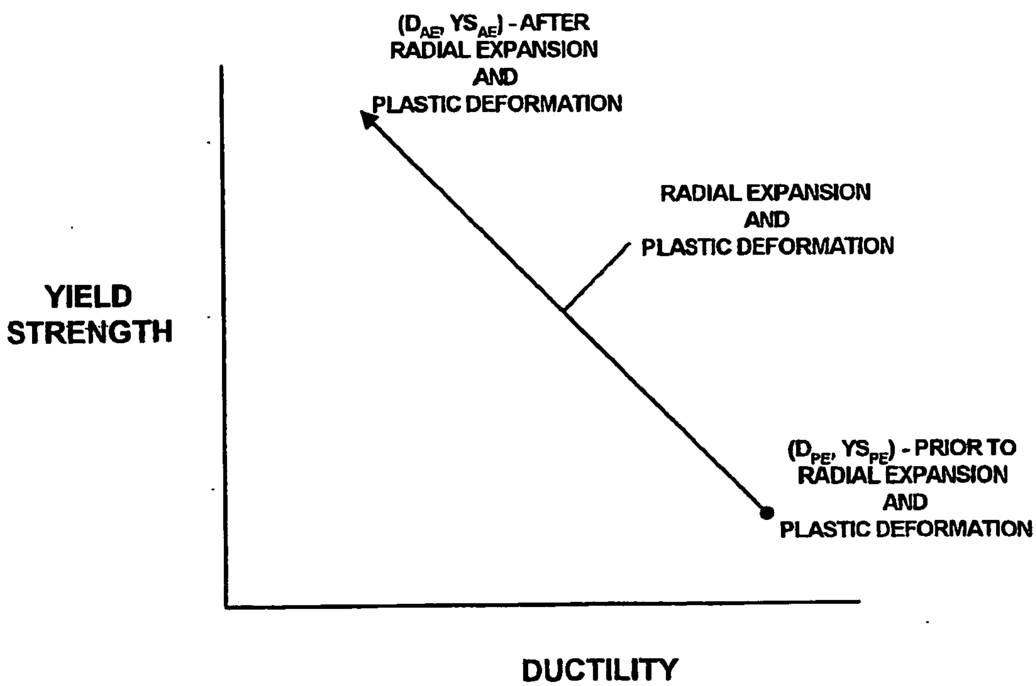

(D_{AE}, YS_{AE}) - AFTER RADIAL EXPANSION AND PLASTIC DEFORMATION
RADIAL EXPANSION AND PLASTIC DEFORMATION
YIELD STRENGTH
(D_{PE}, YS_{PE}) - PRIOR TO RADIAL EXPANSION AND PLASTIC DEFORMATION
DUCTILITY

FIG. 13

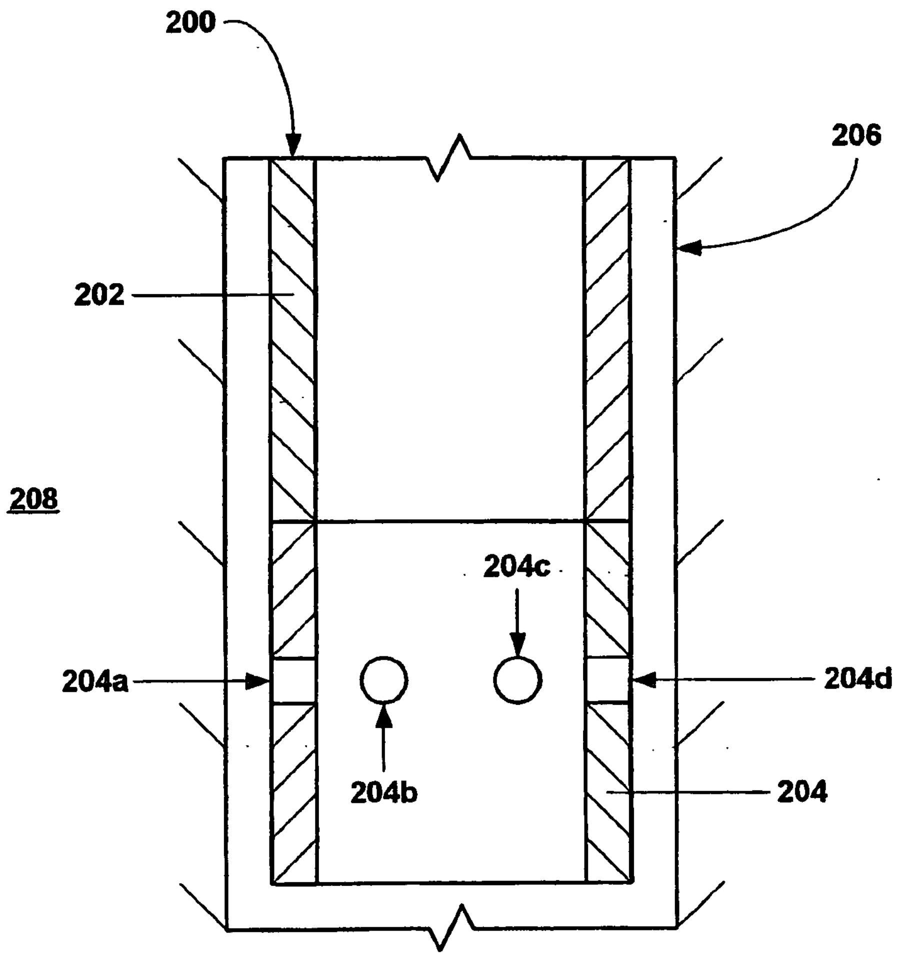


FIG. 14

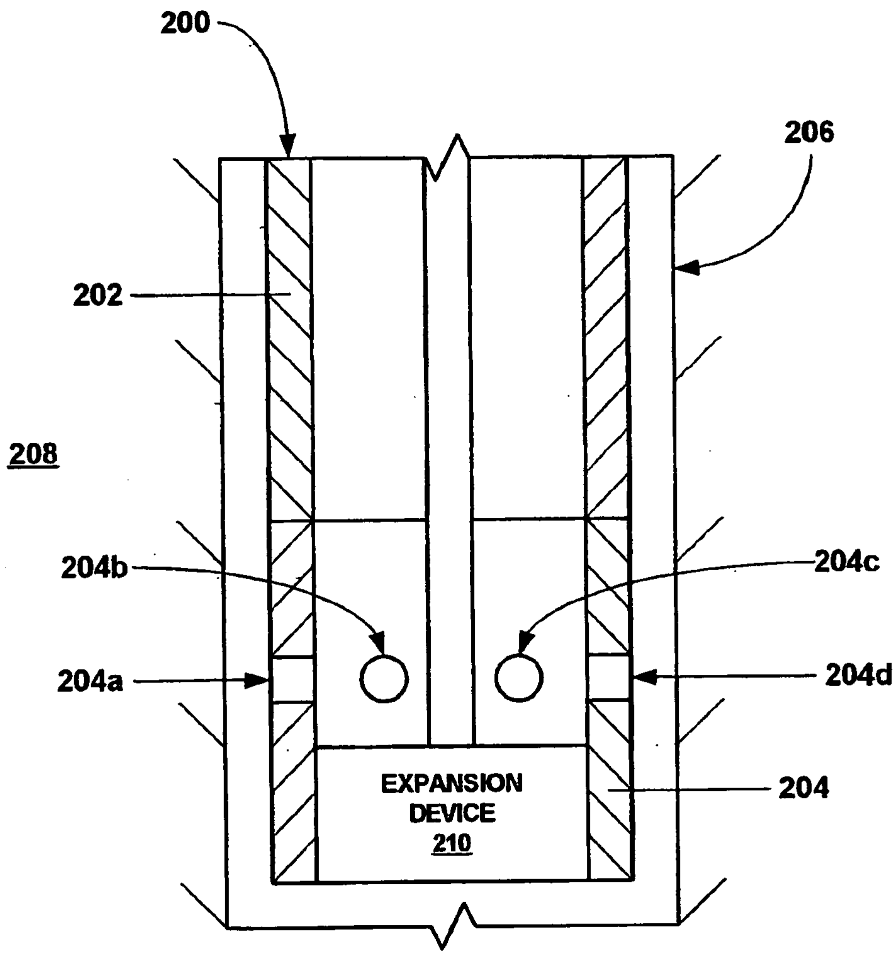


FIG. 15

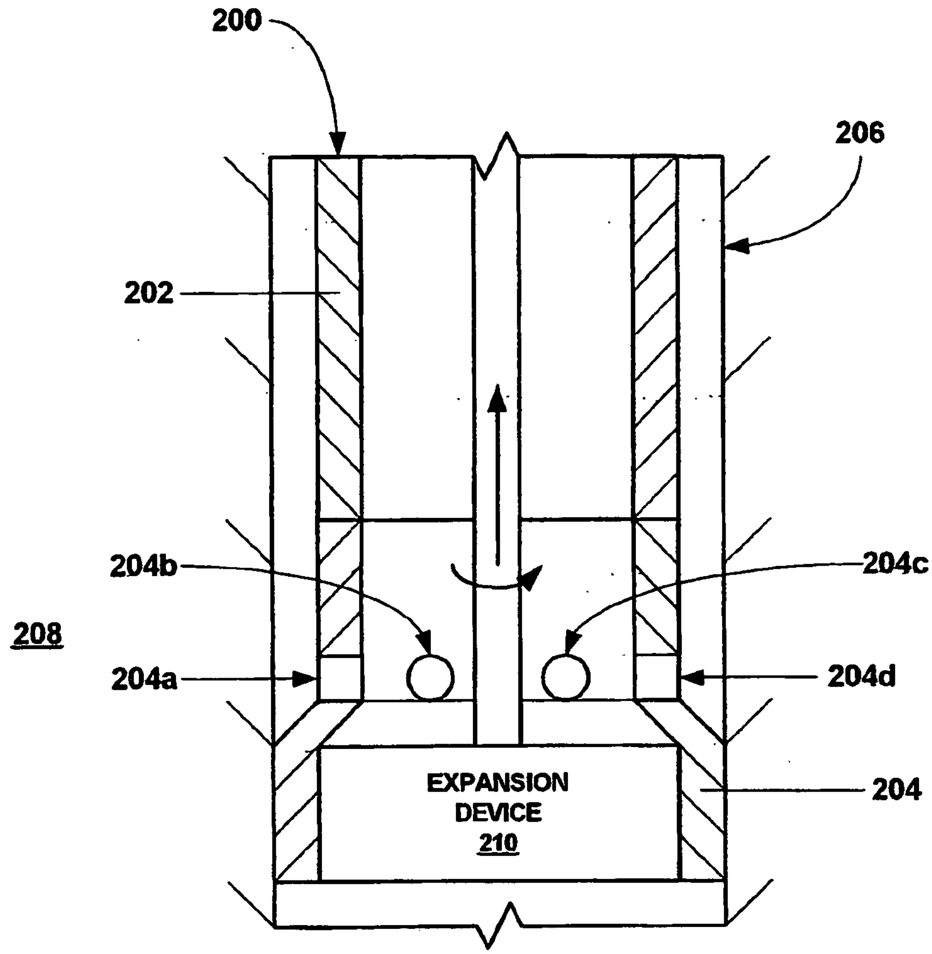


FIG. 16

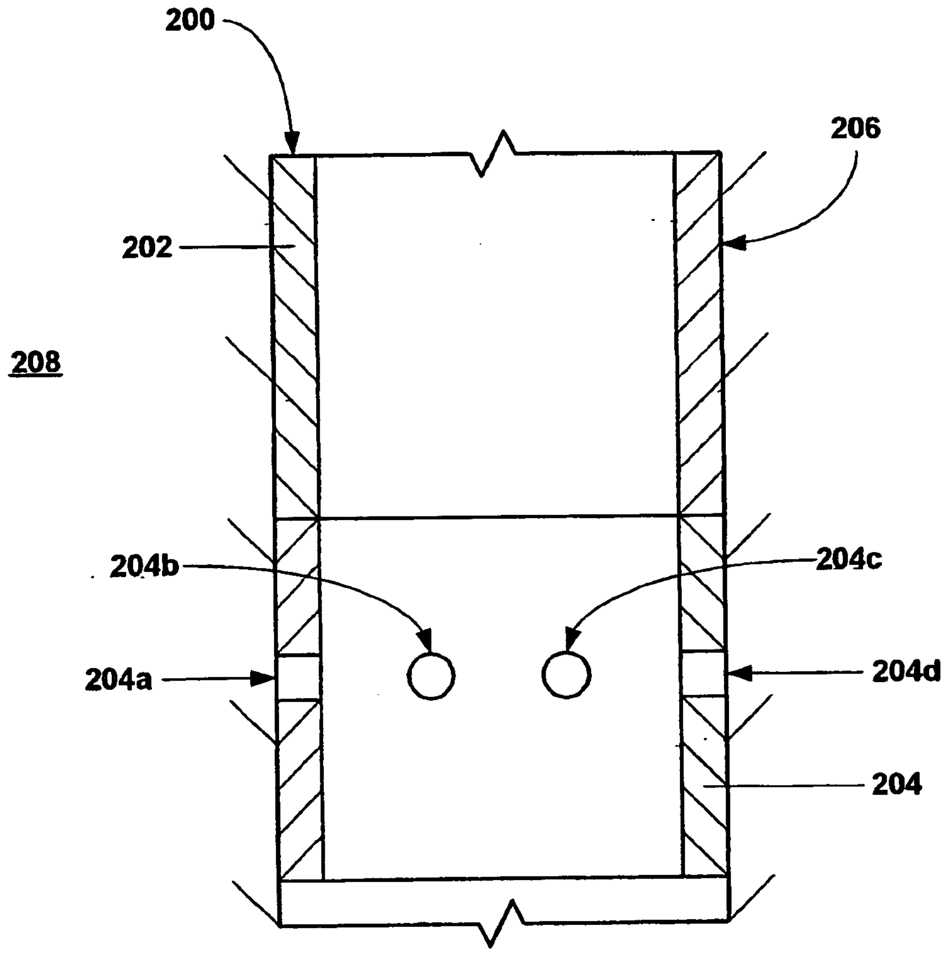


FIG. 17

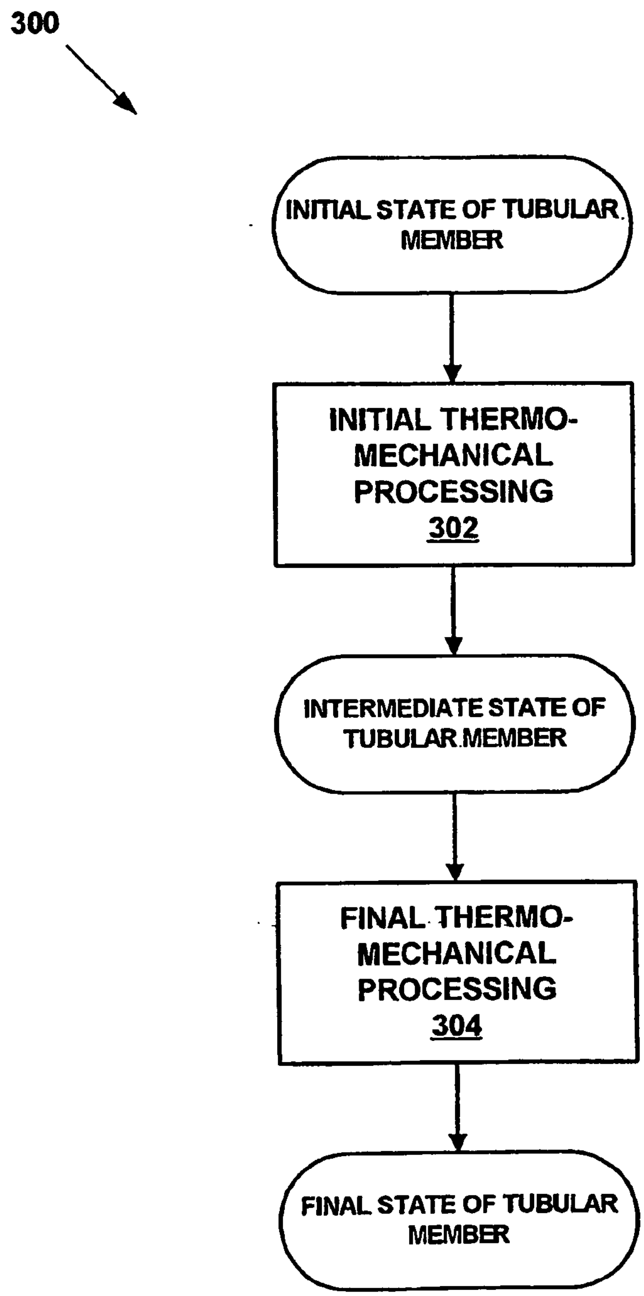
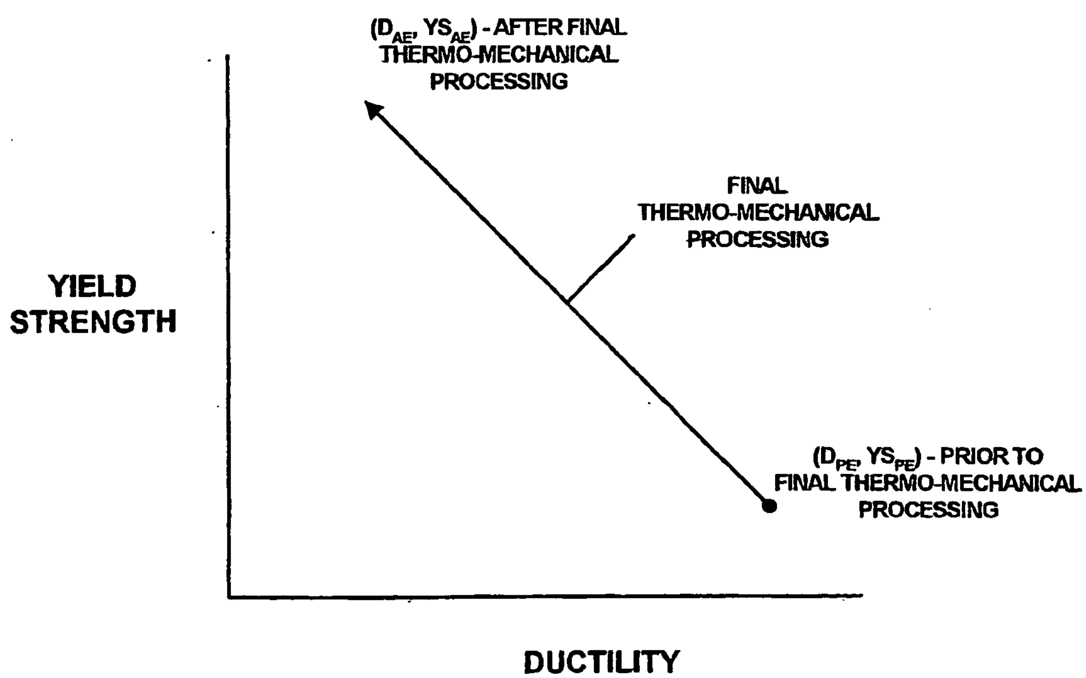

300
INITIAL STATE OF TUBULAR MEMBER
INITIAL THERMO-MECHANICAL PROCESSING 302
INTERMEDIATE STATE OF TUBULAR MEMBER
FINAL THERMO-MECHANICAL PROCESSING 304
FINAL STATE OF TUBULAR MEMBER

Fig. 18



(D_{AE}, YS_{AE}) - AFTER FINAL THERMO-MECHANICAL PROCESSING
FINAL THERMO-MECHANICAL PROCESSING
YIELD STRENGTH
(D_{PE}, YS_{PE}) - PRIOR TO FINAL THERMO-MECHANICAL PROCESSING
DUCTILITY

FIG. 19

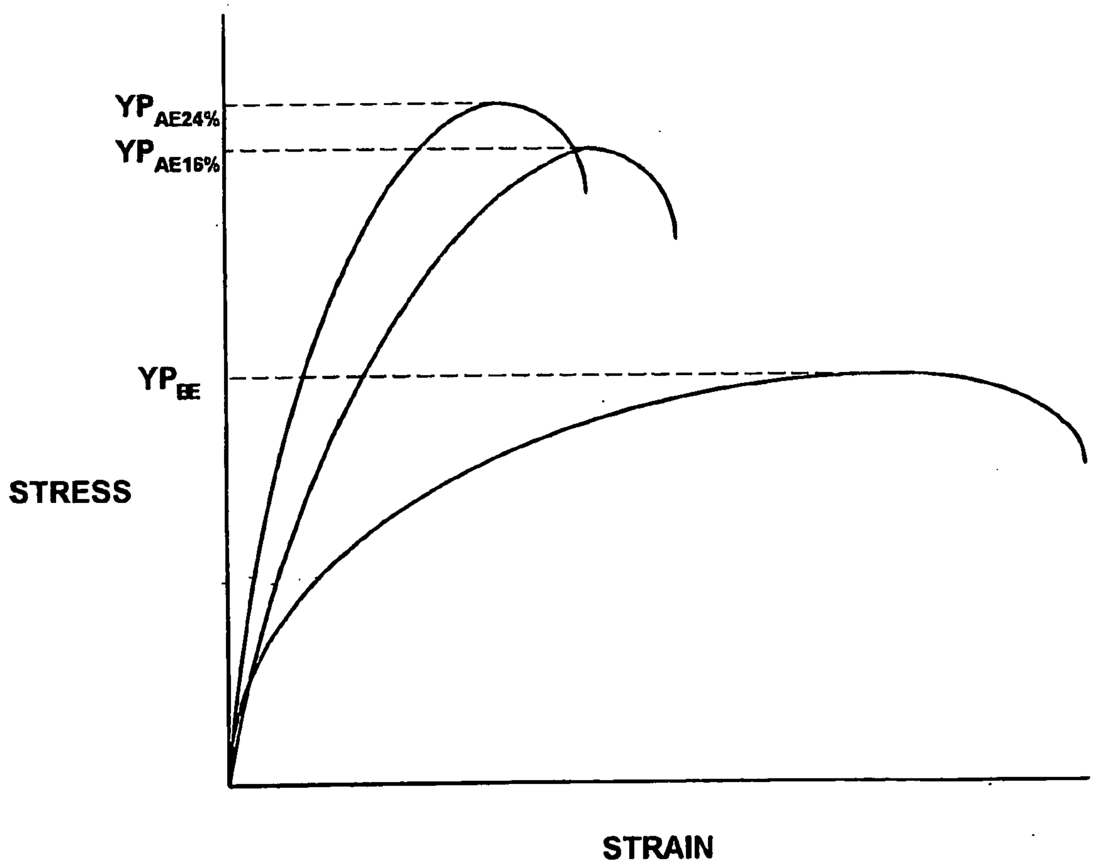


FIG. 20

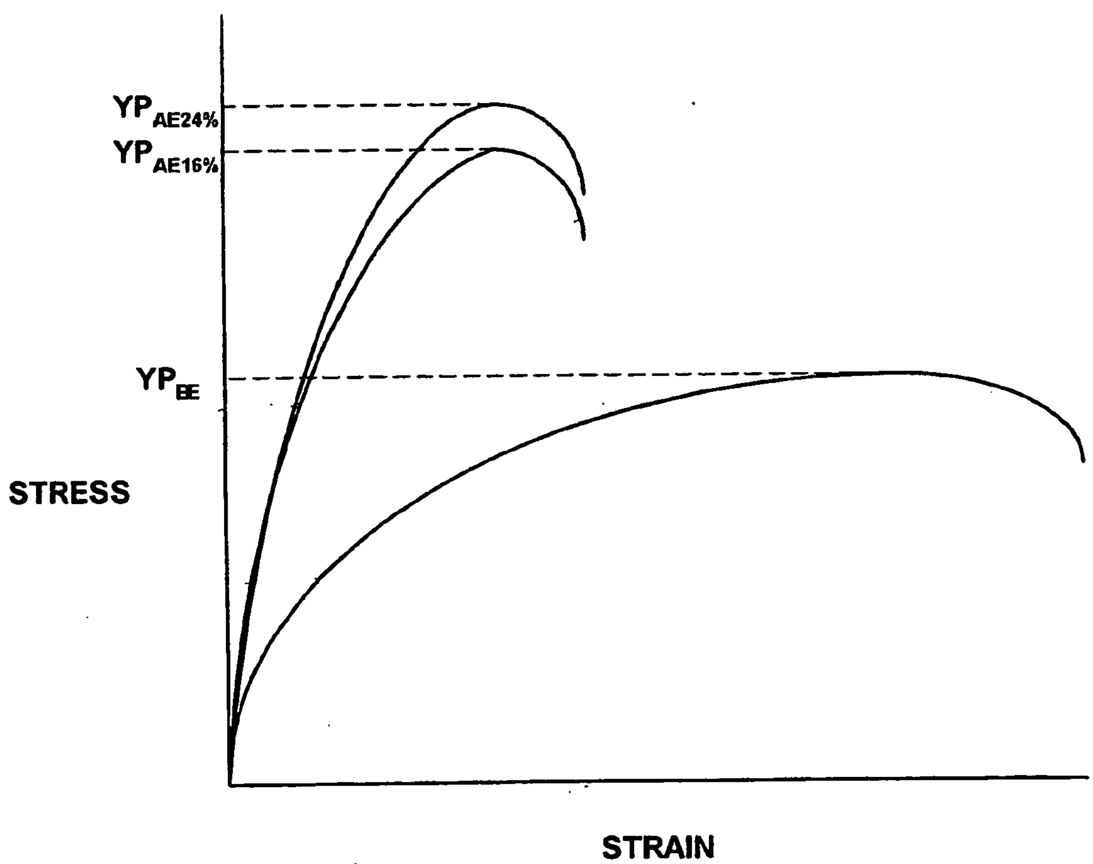


FIG. 21

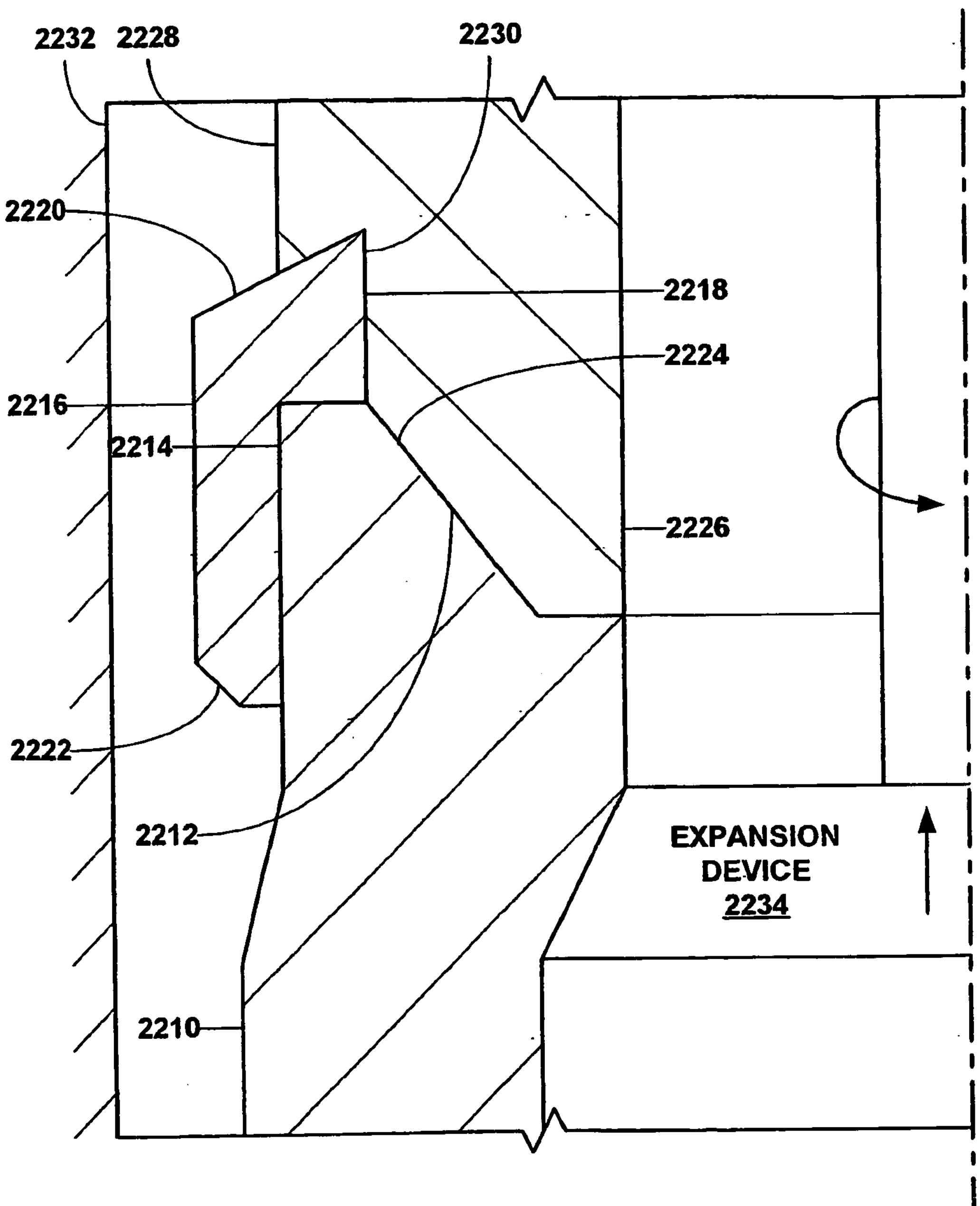

2232
2228
2230
2220
2218
2224
2216
2214
2226
2222
2212
EXPANSION DEVICE 2234
2210

FIG. 22

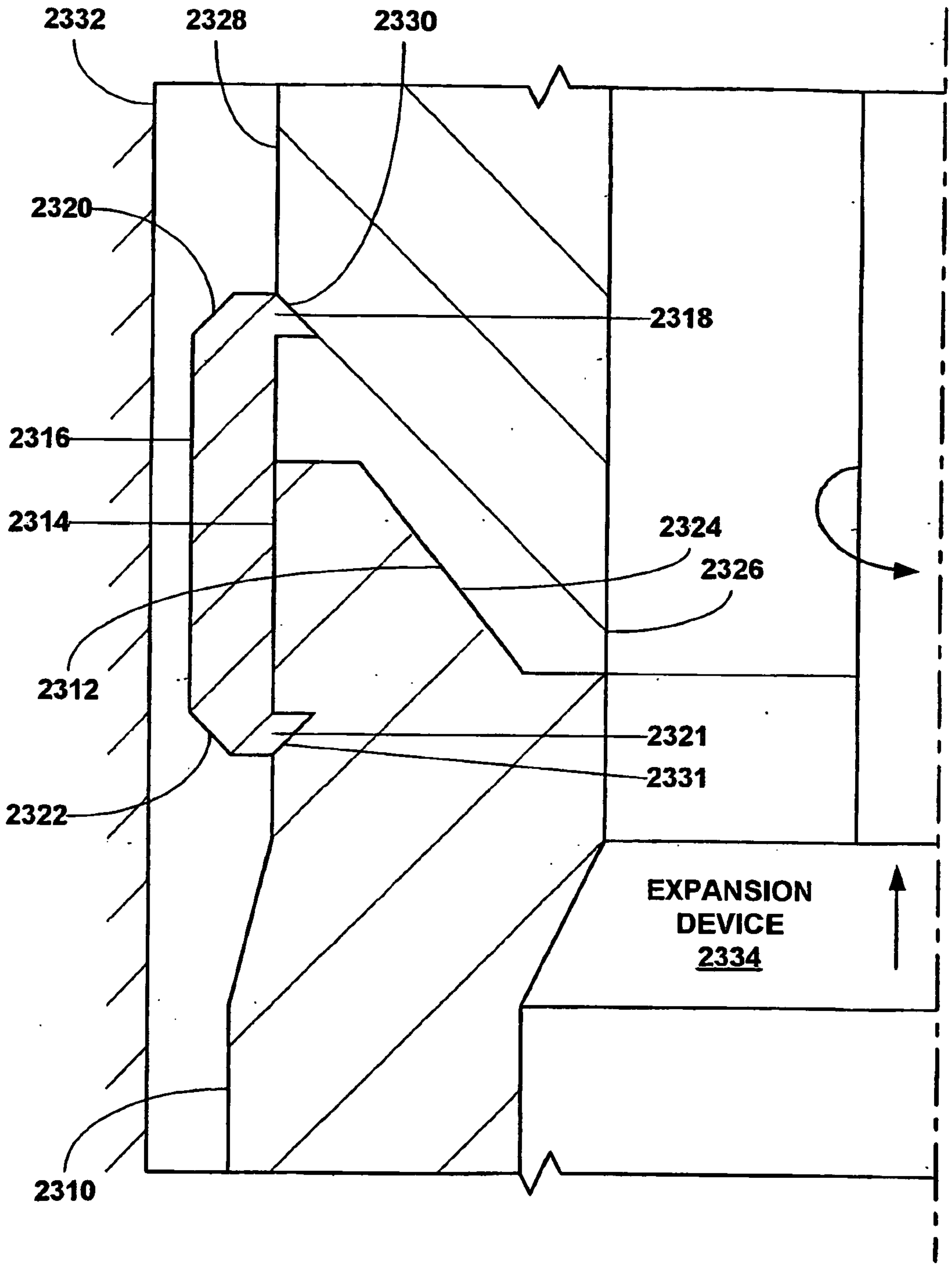
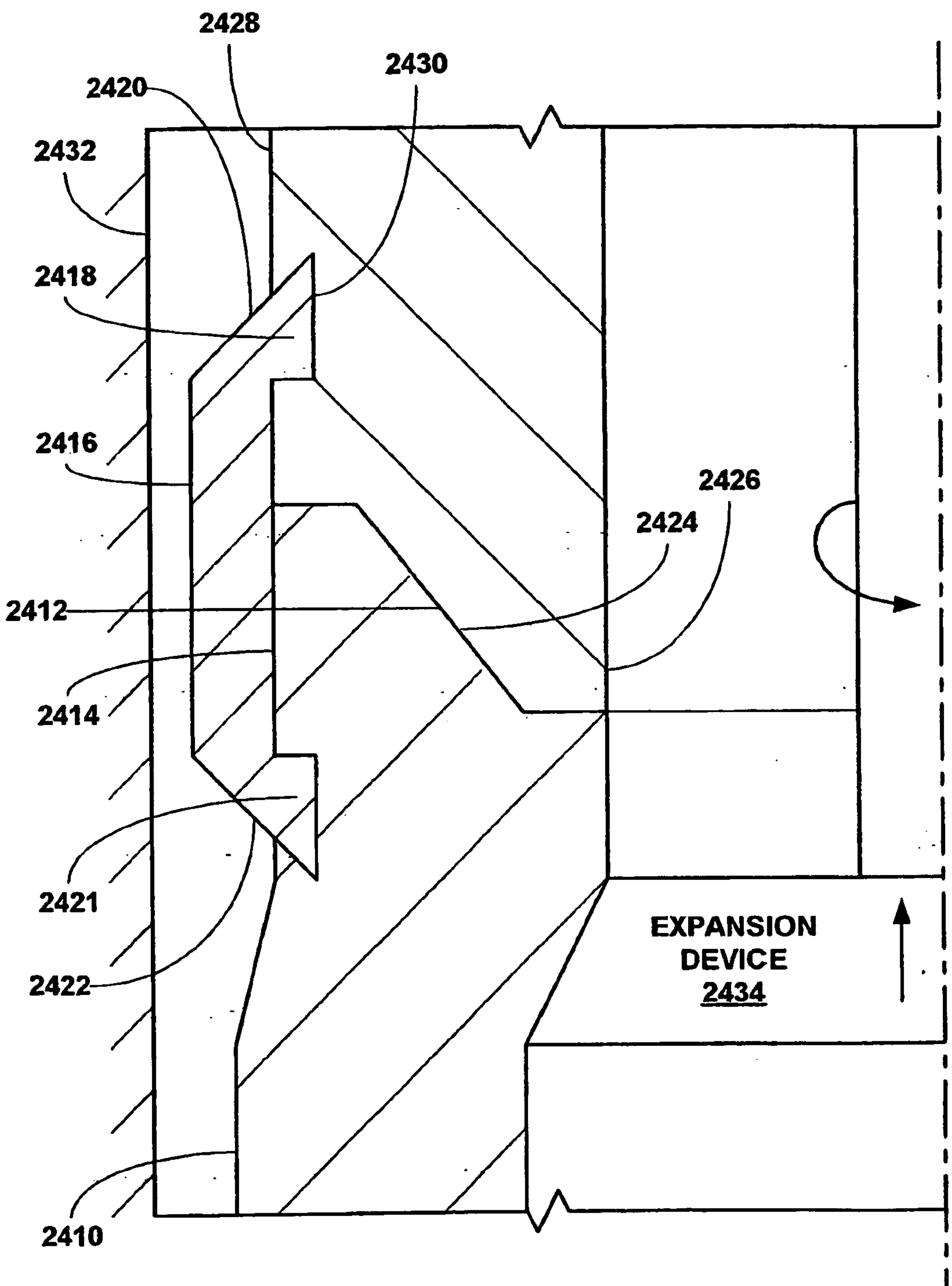

2332
2328
2330
2320
2318
2316
2314
2324
2326
2312
2321
2331
2322
EXPANSION
DEVICE
2334
2310

FIG. 23


2428
2430
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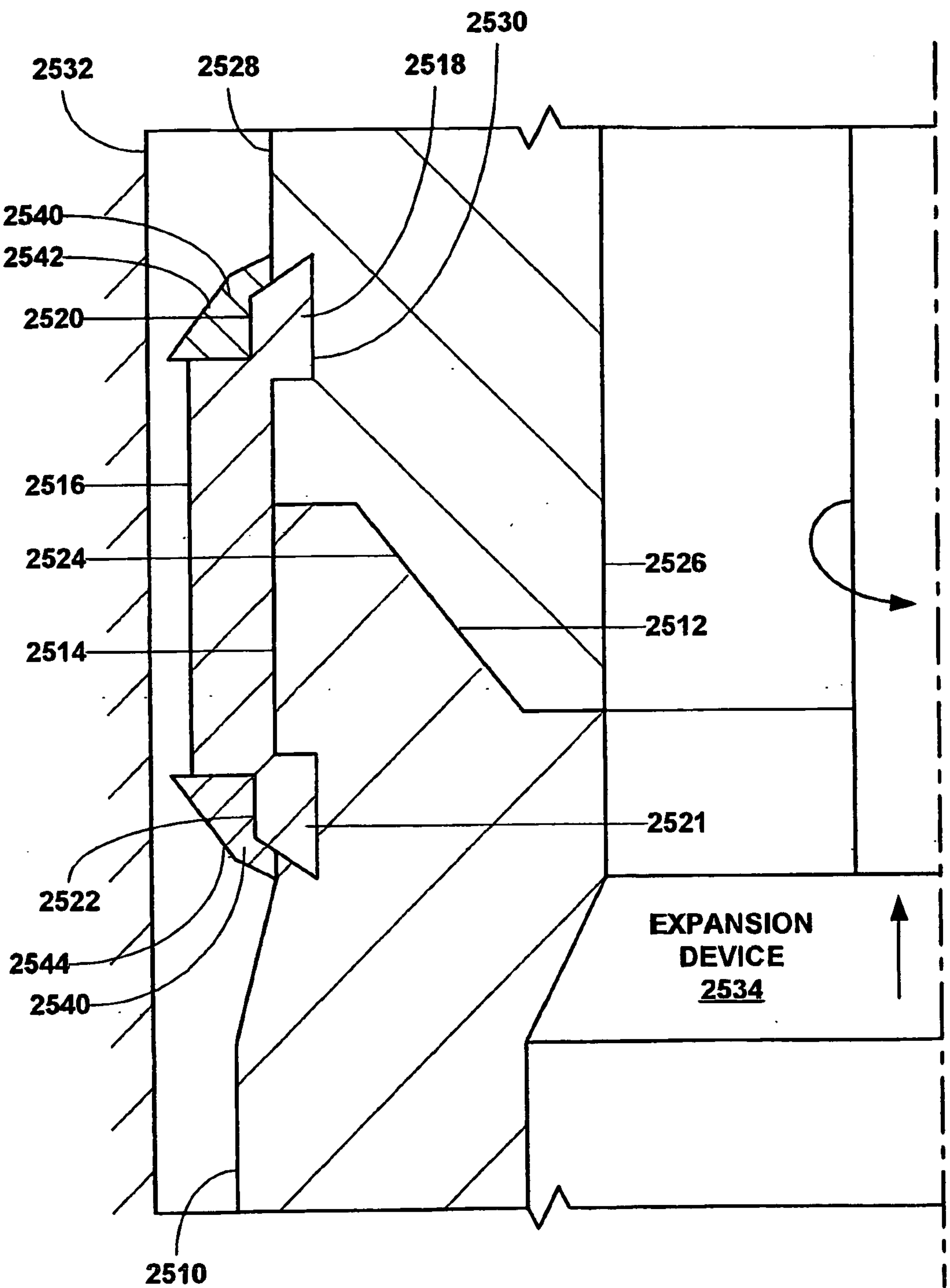
2432
2418
2416
2426
2424
2412
2414
2421
2422
2410
EXPANSION
DEVICE
2434

FIG. 24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2532
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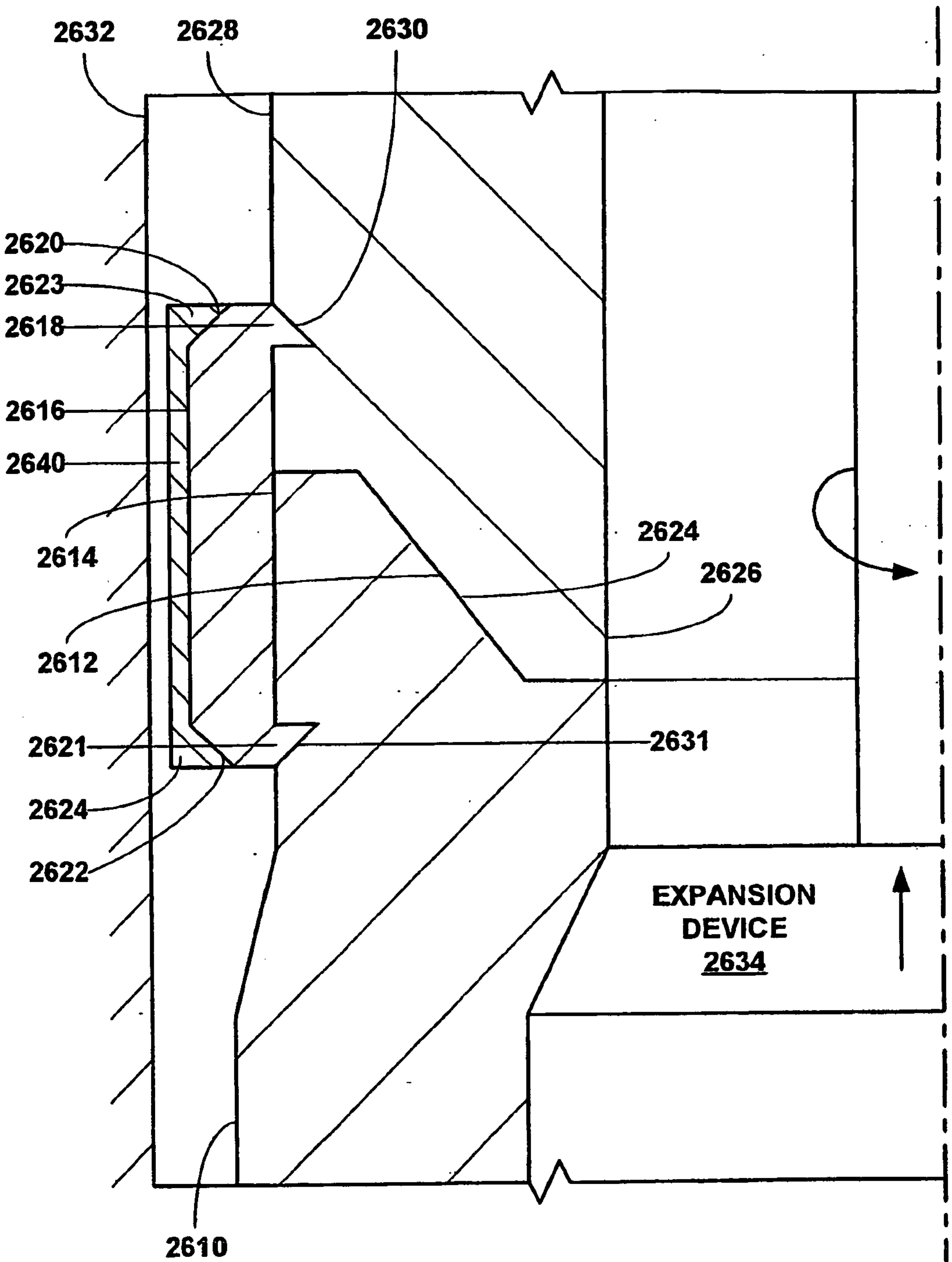
2518
2540
2542
2520
2516
2524
2526
2512
2514
2521
2522
2544
2540
EXPANSION
DEVICE
2534
2510

FIG. 25


2632
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2620
2623
2618
2616
2640
2614
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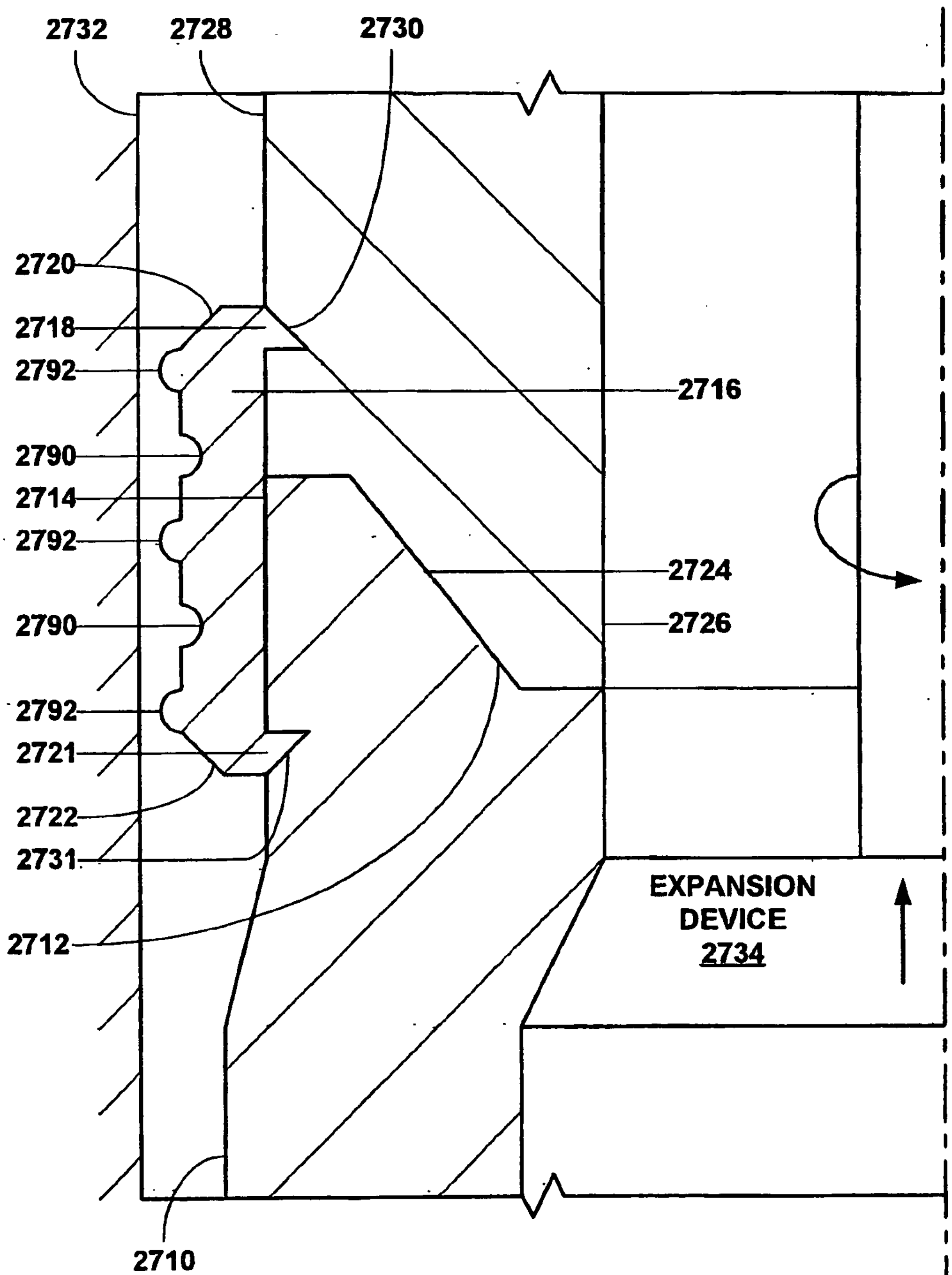
2626
2612
2621
2631
2624
2622
EXPANSION DEVICE 2634
2610

FIG. 26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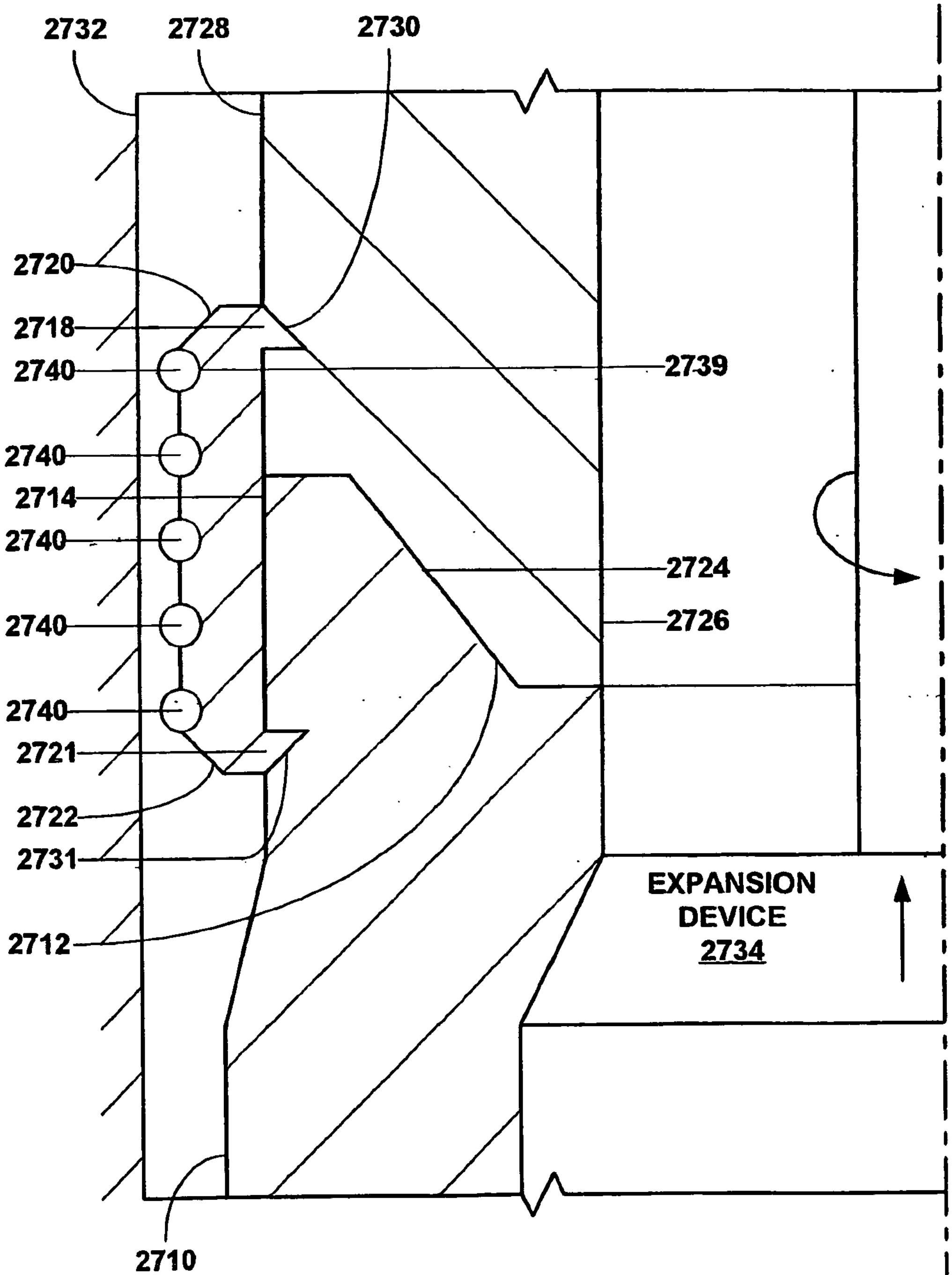
2792
2716
2790
2714
2792
2724
2790
2726
2792
2721
2722
2731
2712
EXPANSION
DEVICE
2734
2710

FIG. 27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2739
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2724
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2726
2740
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2722
2731
2712
EXPANSION DEVICE 2734
2710

FIG. 28

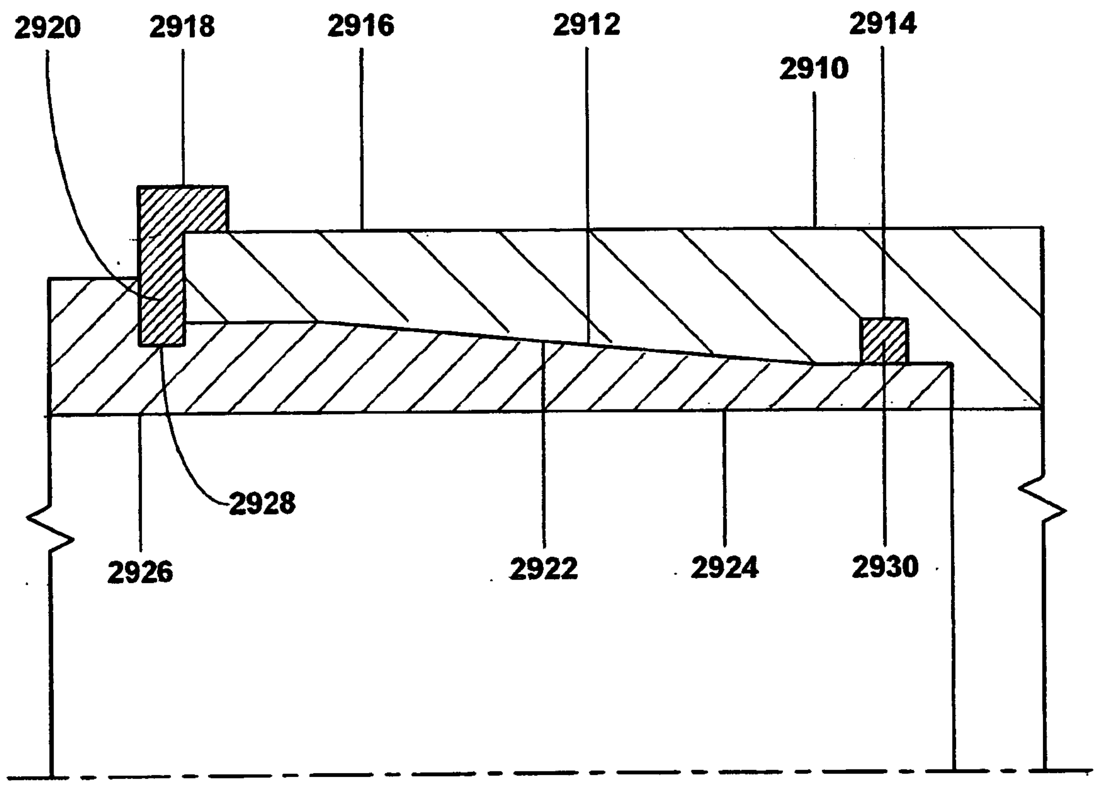


FIG. 29

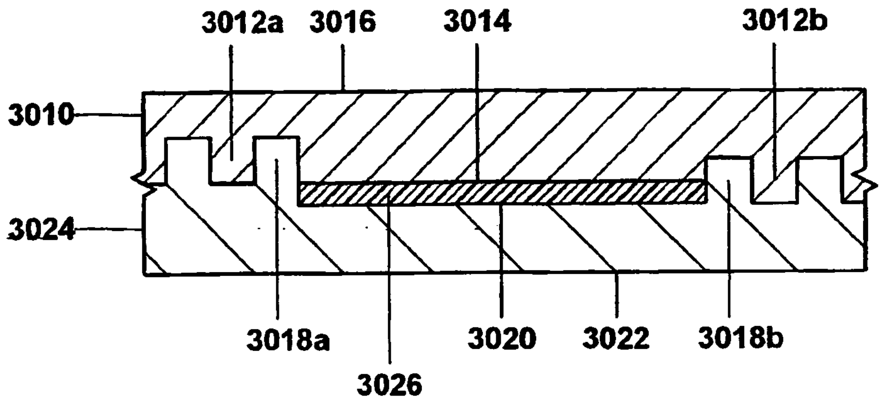


FIG. 30a

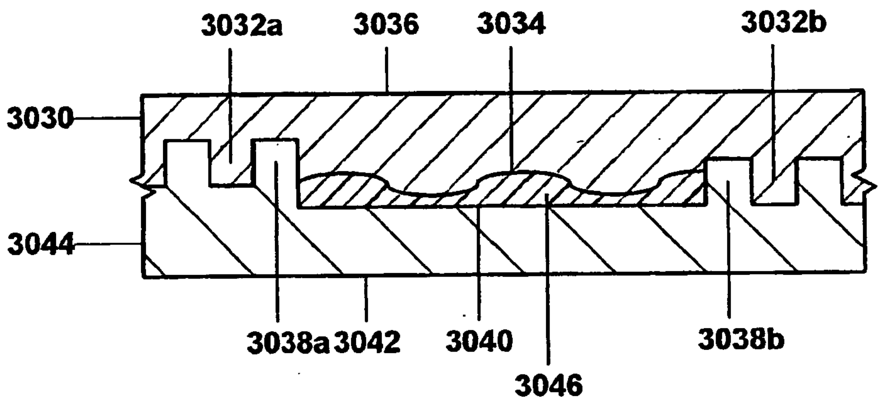


FIG. 30b

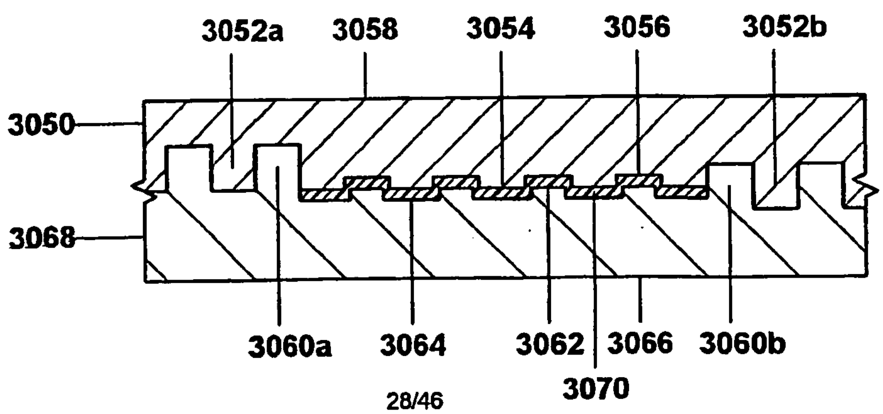


FIG. 30c

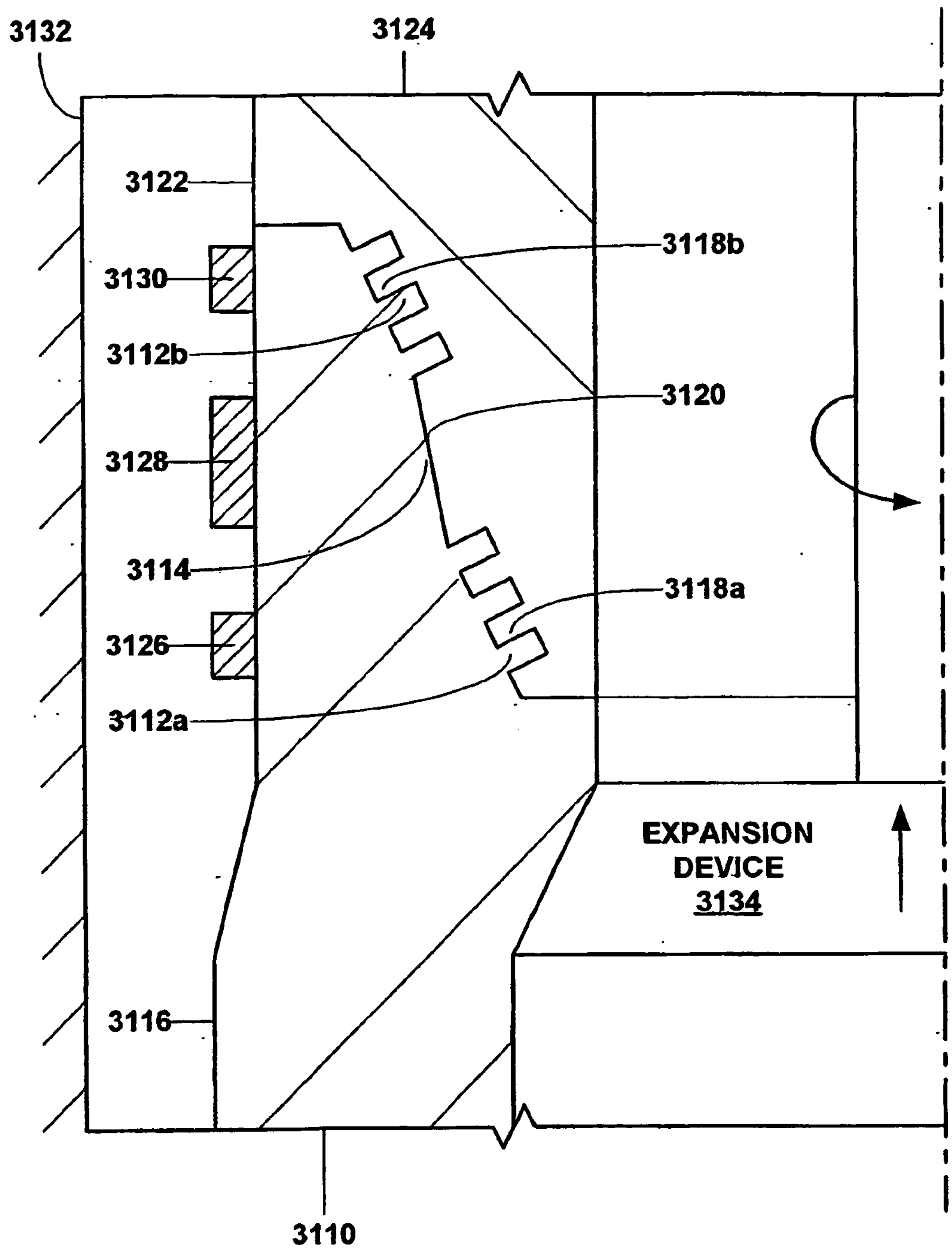

3132
3124
3122
3118b
3130
3112b
3120
3128
3114
3118a
3126
3112a
EXPANSION
DEVICE
3134
3116
3110

FIG. 31

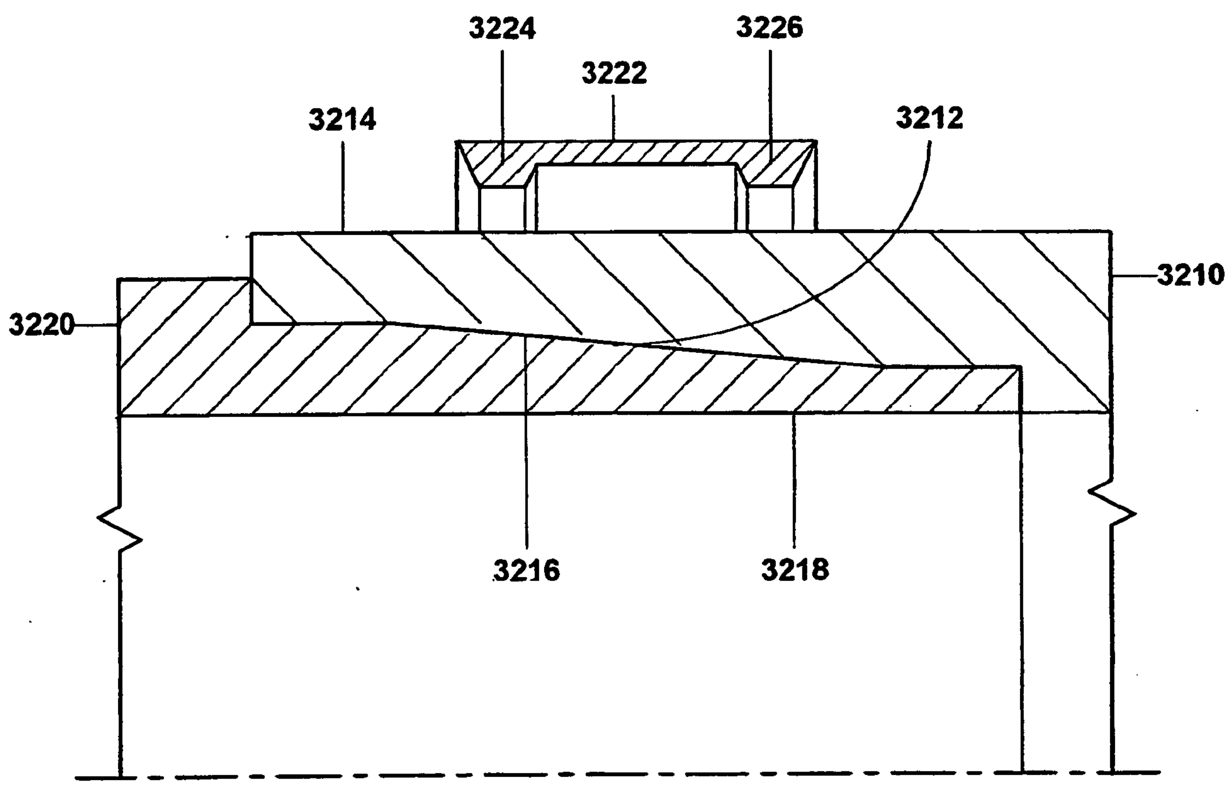


FIG. 32a

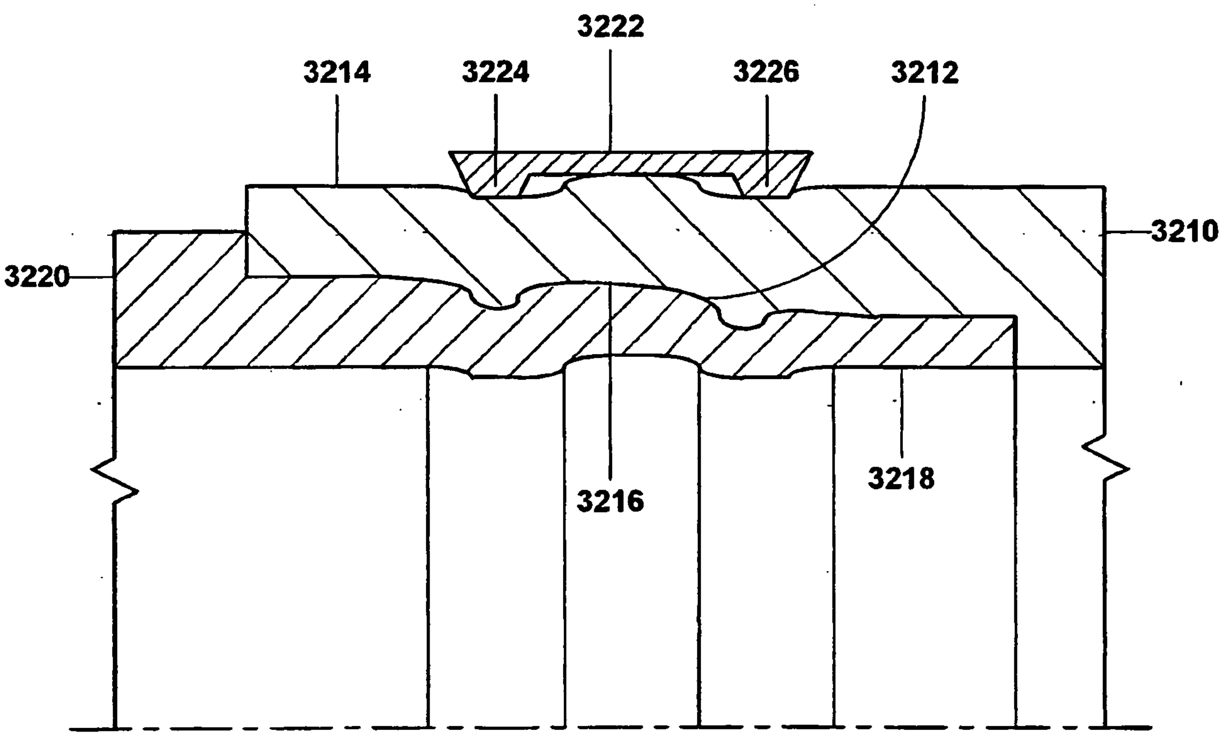


FIG. 32b

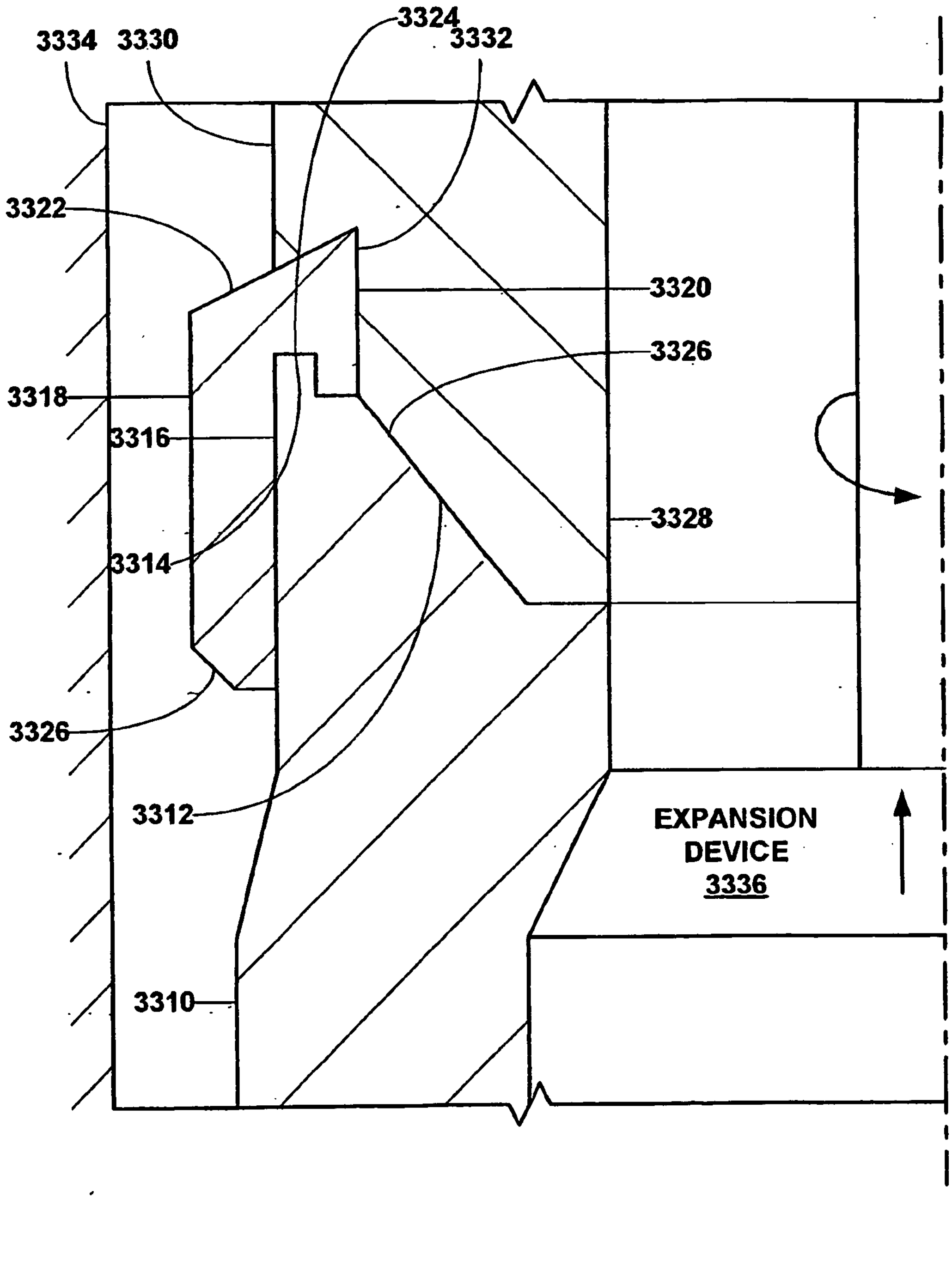
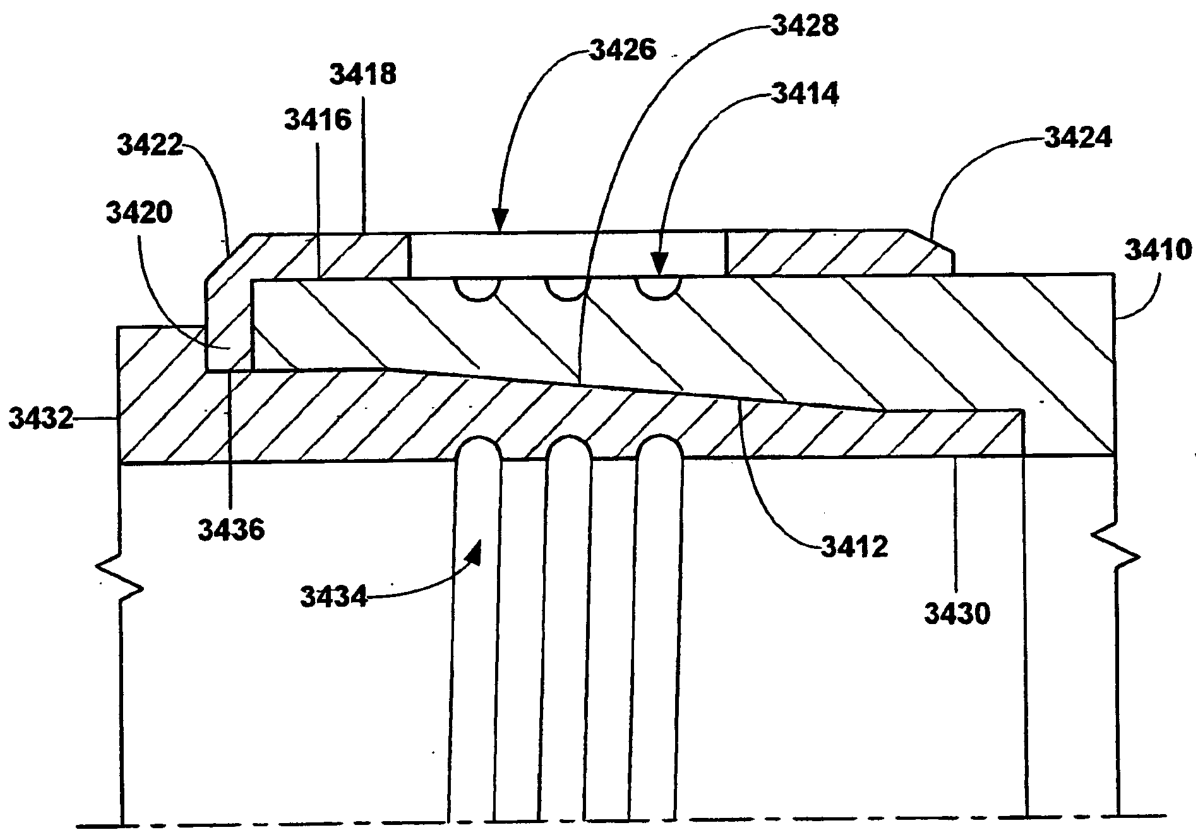

3334
3330
3324
3332
3322
3320
3326
3318
3316
3328
3314
3326
3312
EXPANSION DEVICE 3336
3310

FIG. 33


3428
3426
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3414
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3424
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3410
3432
3436
3412
3434
3430

FIG. 34a

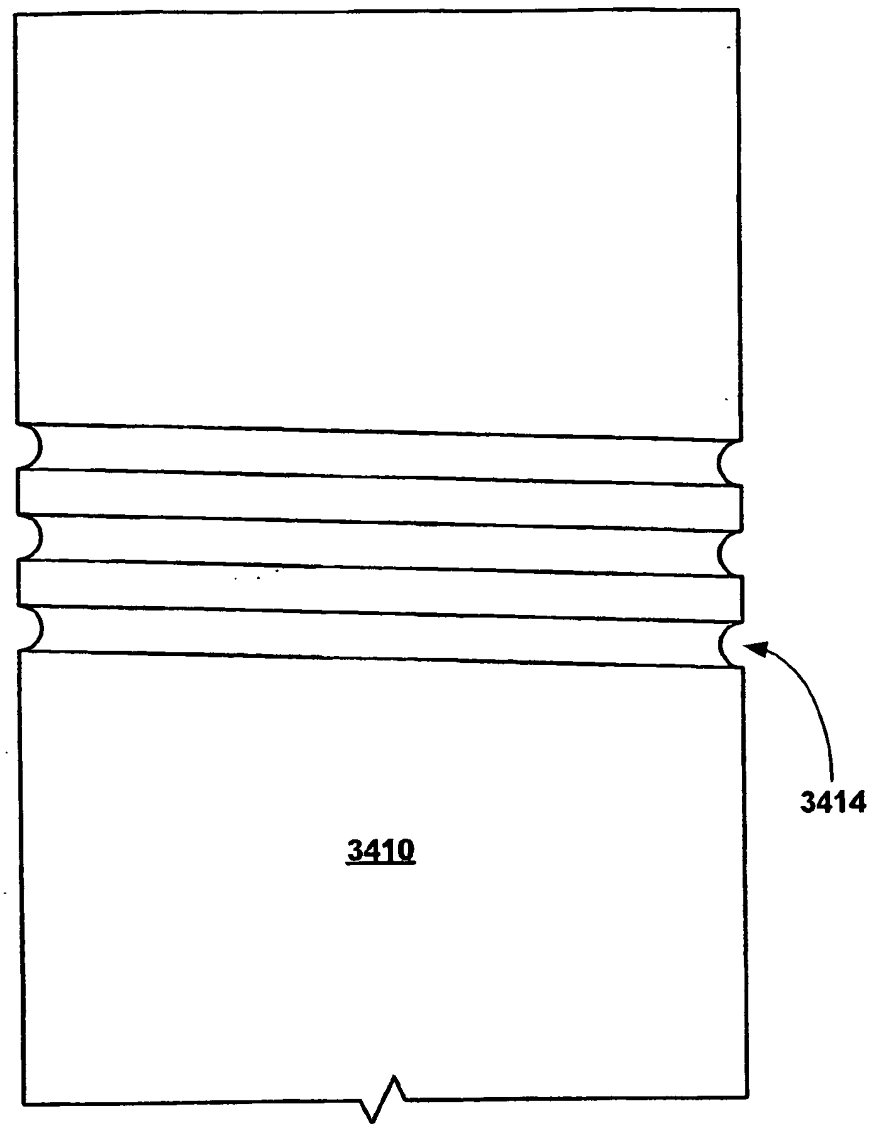

Fig. 34b

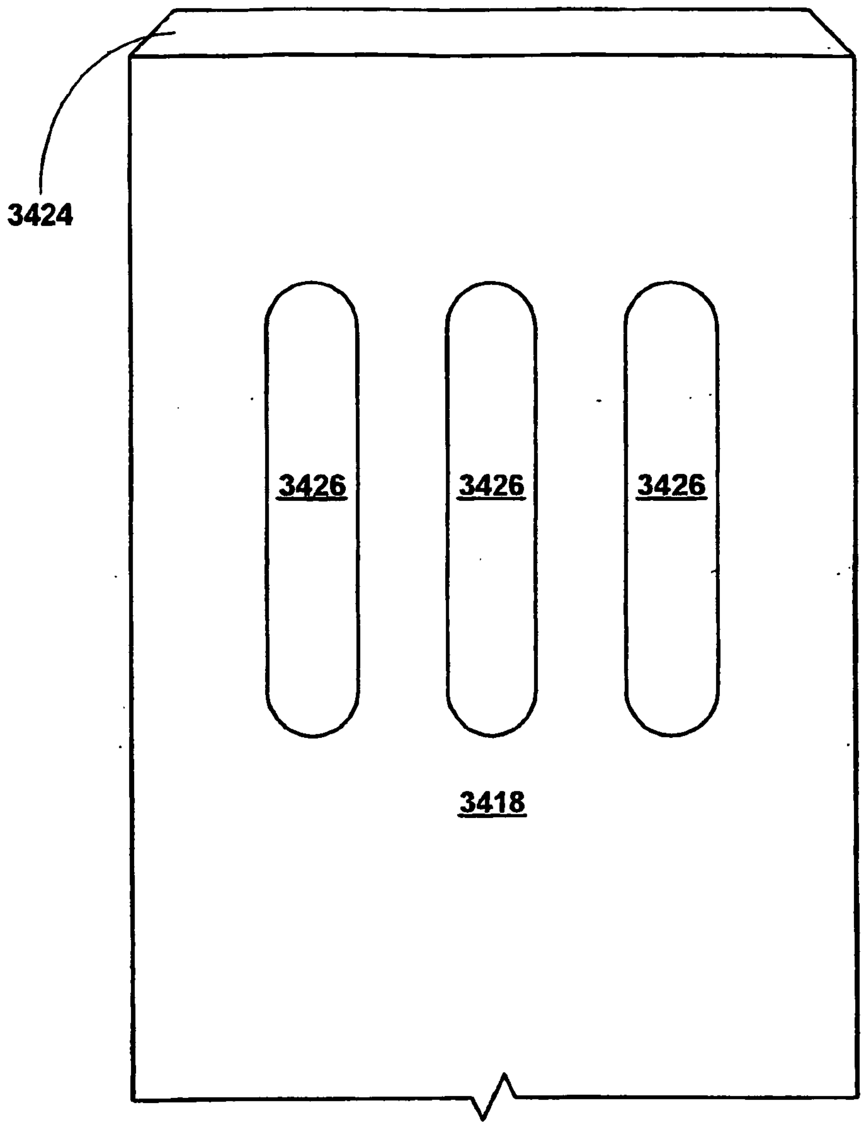

Fig. 34c

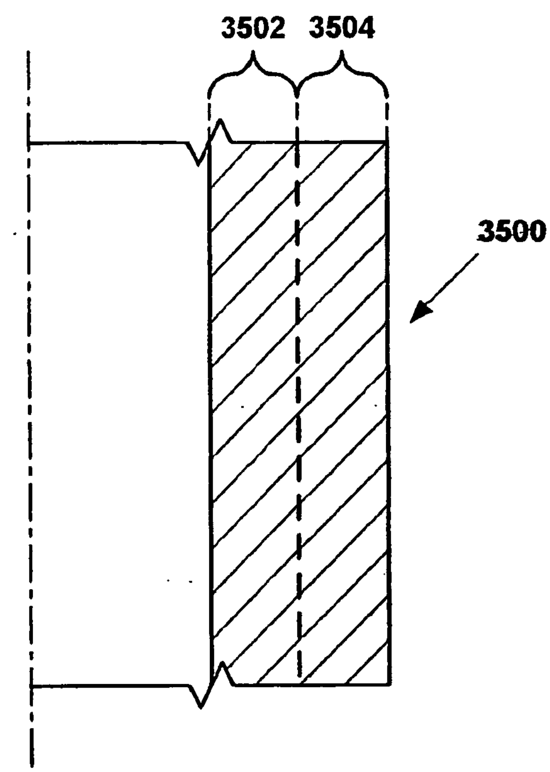

FIG. 35a

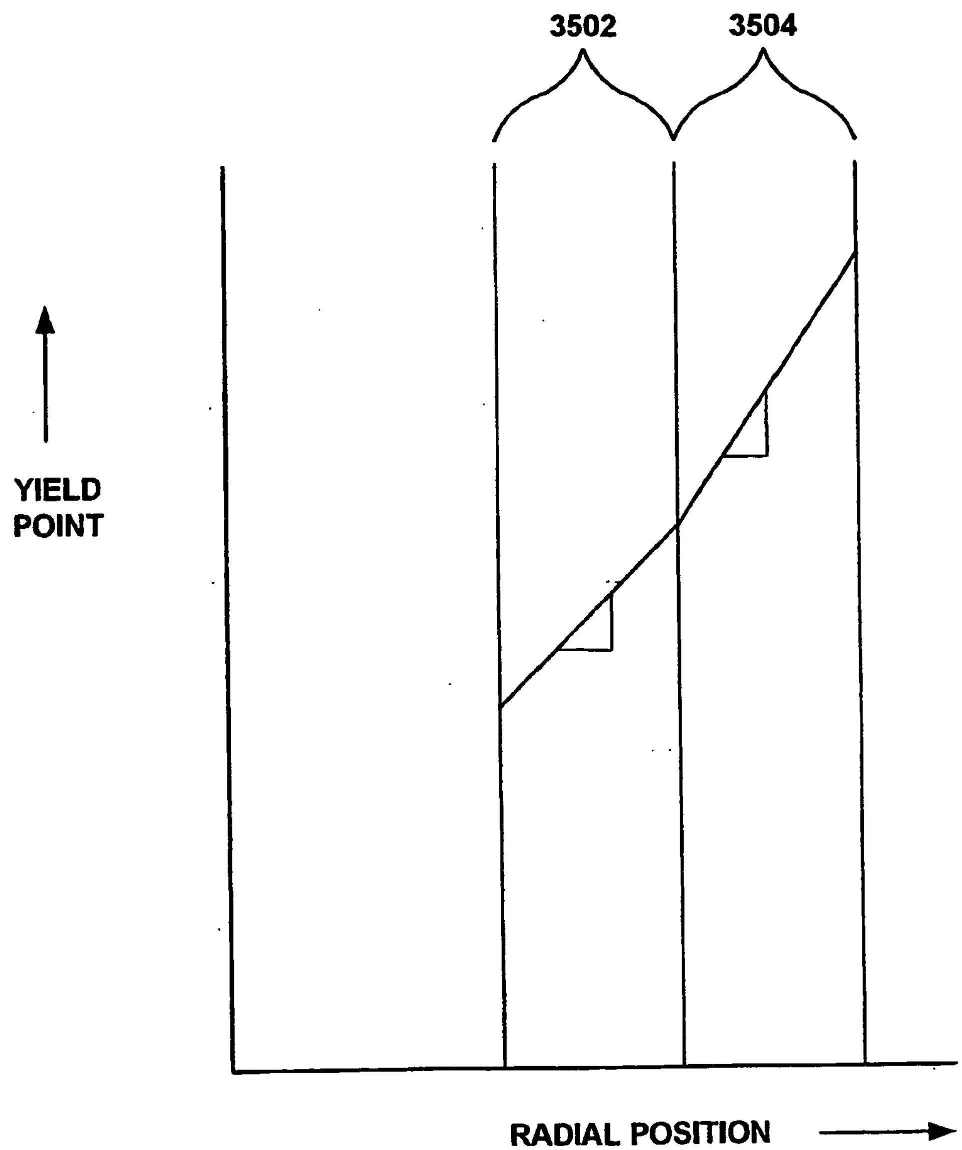

FIG. 35b

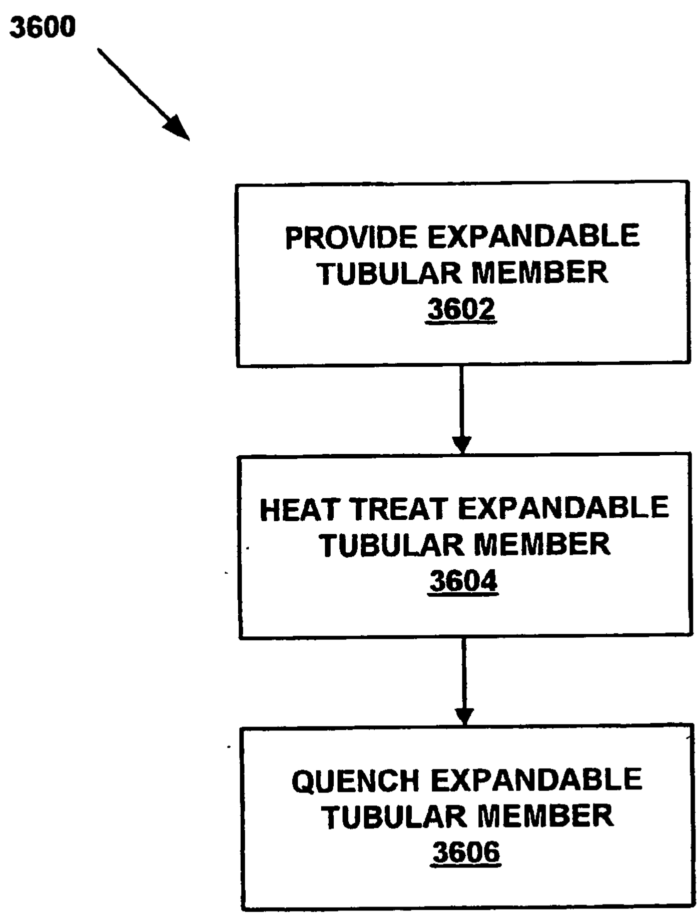
3600
PROVIDE EXPANDABLE TUBULAR MEMBER
3602
HEAT TREAT EXPANDABLE TUBULAR MEMBER
3604
QUENCH EXPANDABLE TUBULAR MEMBER
3606

FIG. 36a

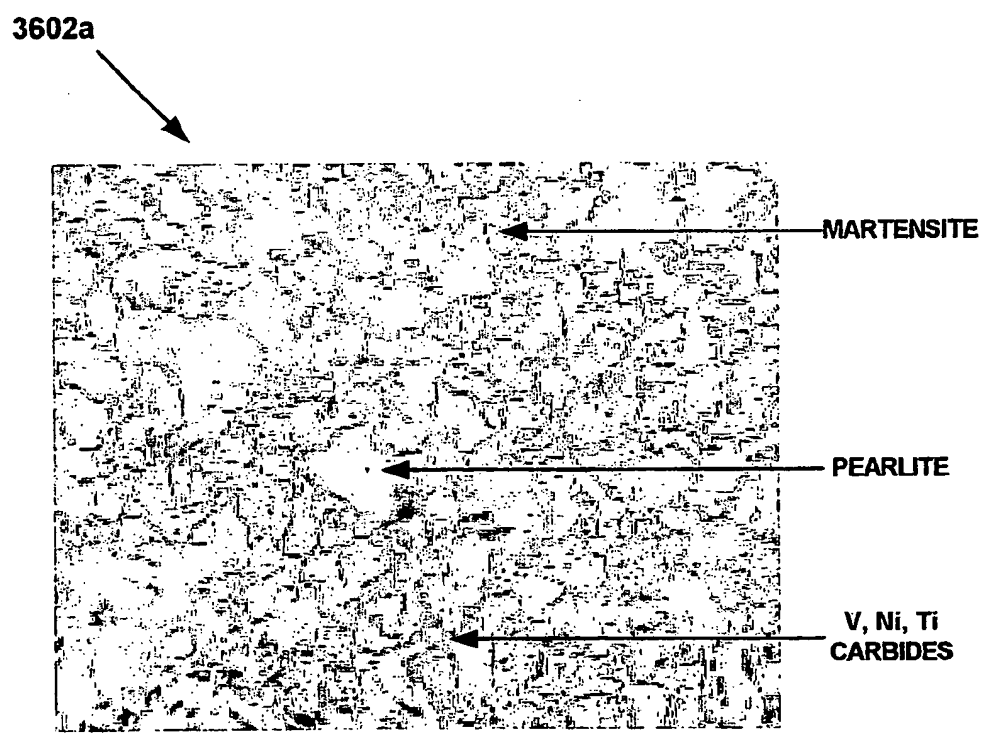

Fig. 36b

3602a

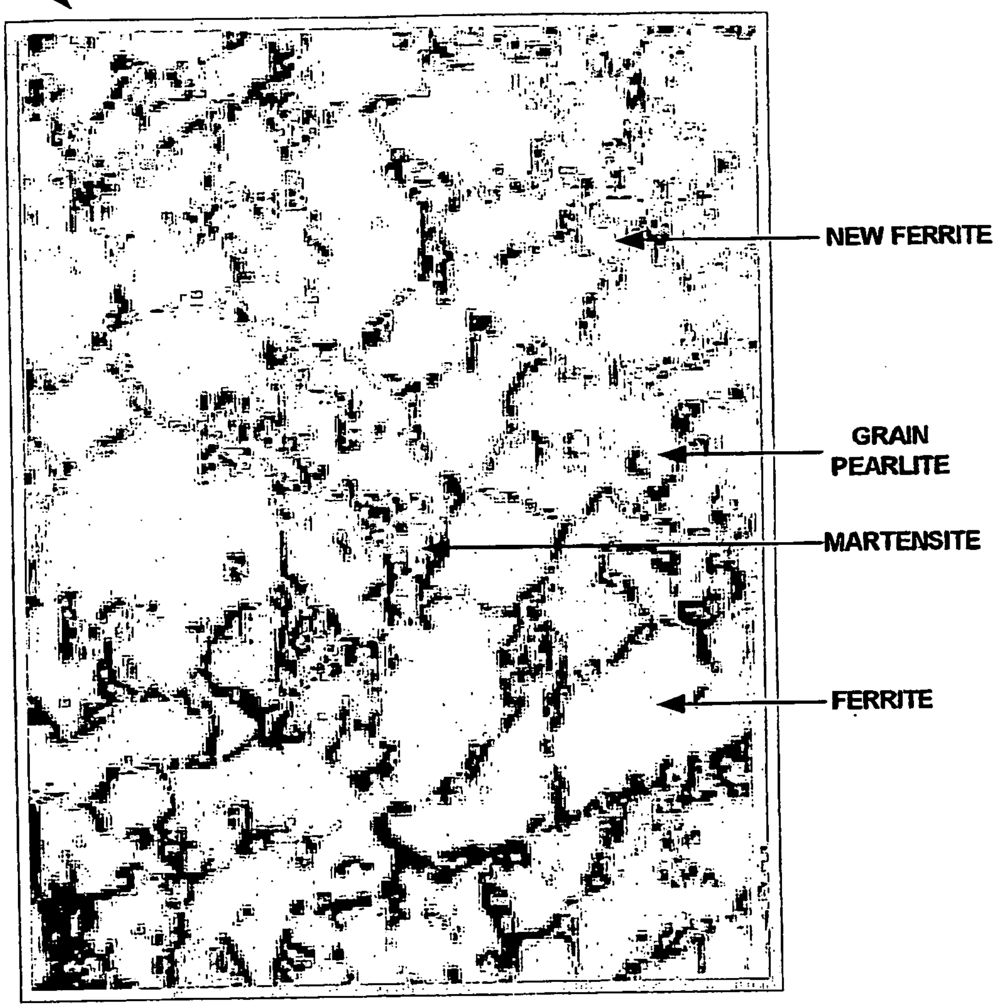

Fig. 36c

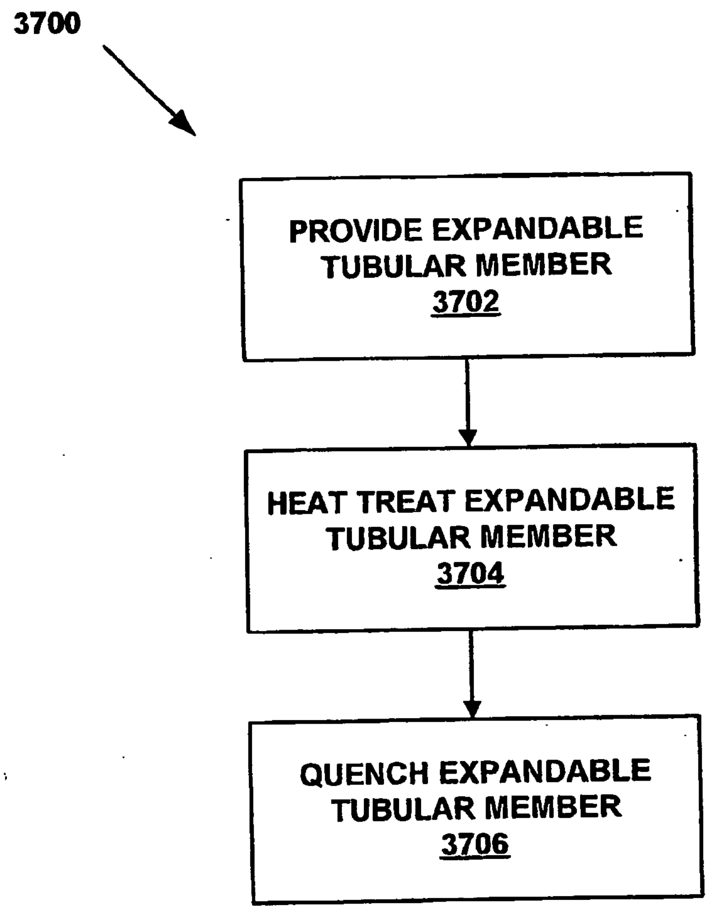
3700
PROVIDE EXPANDABLE TUBULAR MEMBER 3702
HEAT TREAT EXPANDABLE TUBULAR MEMBER 3704
QUENCH EXPANDABLE TUBULAR MEMBER 3706

FIG. 37a

3702a

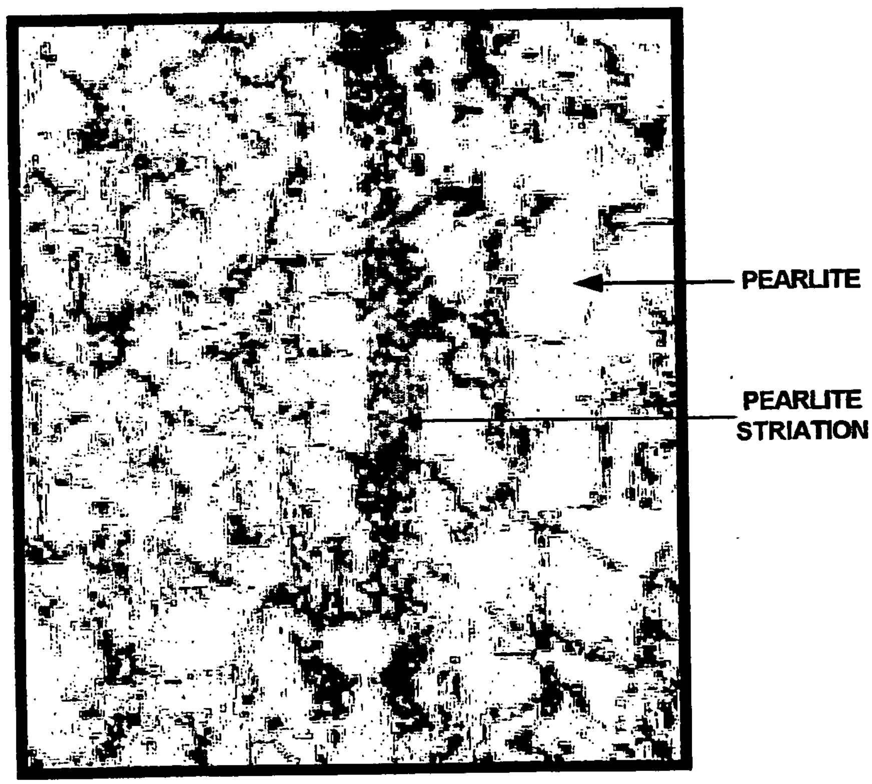

Fig. 37b

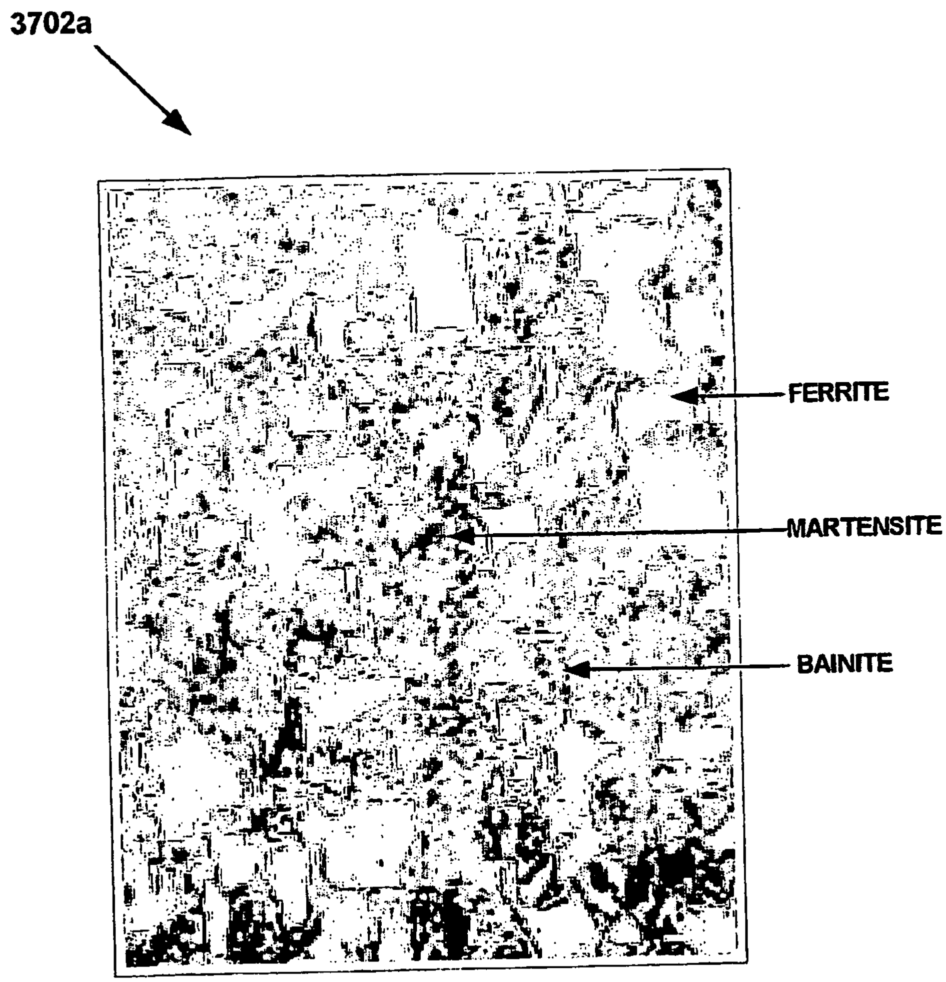

Fig. 37c

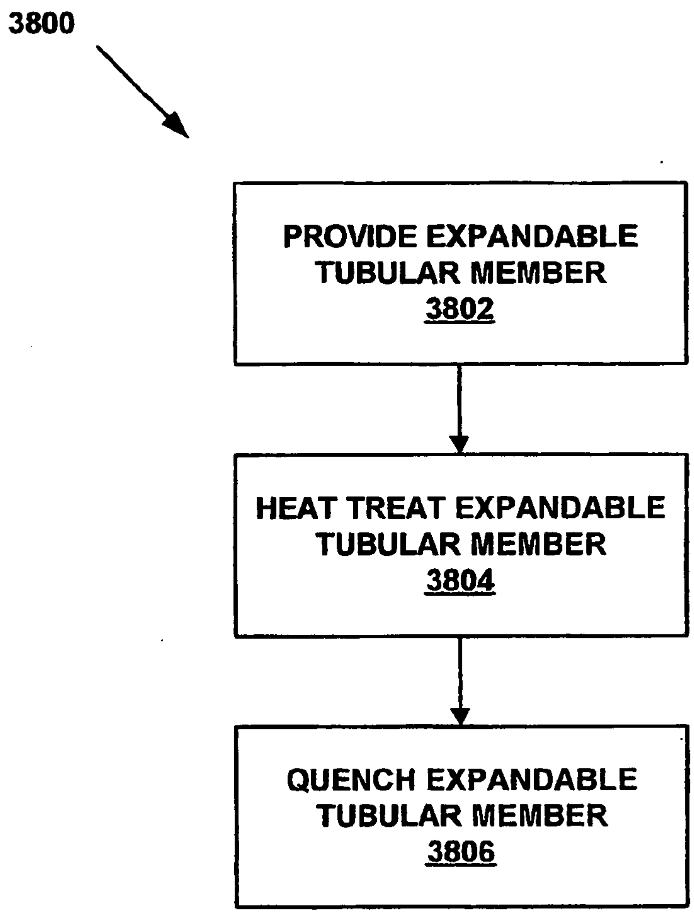
3800
PROVIDE EXPANDABLE TUBULAR MEMBER
3802
HEAT TREAT EXPANDABLE TUBULAR MEMBER
3804
QUENCH EXPANDABLE TUBULAR MEMBER
3806

FIG. 38a

3802a

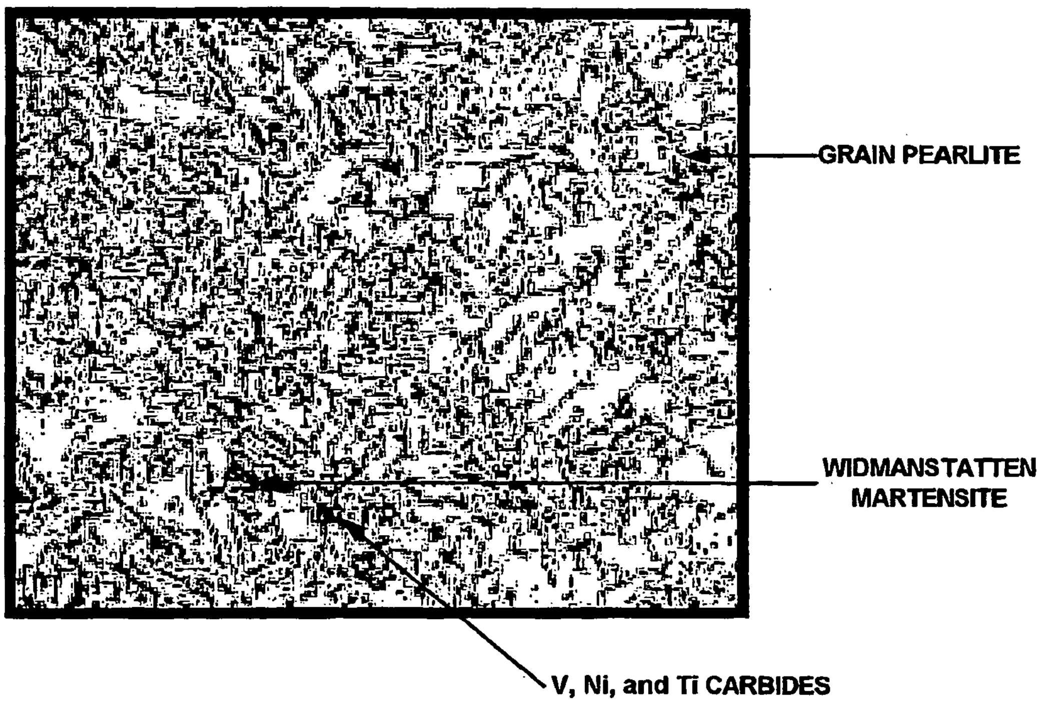

Fig. 38b

3802a

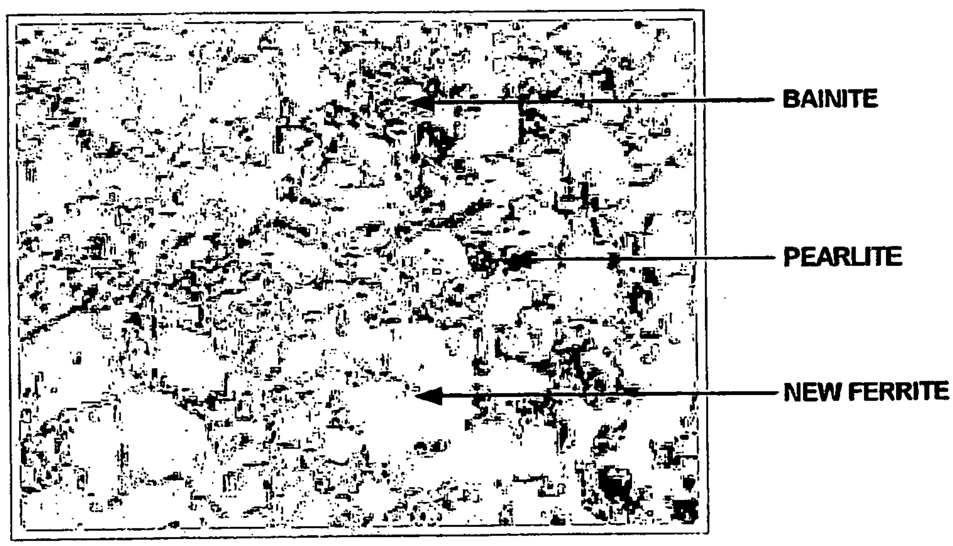

Fig. 38c